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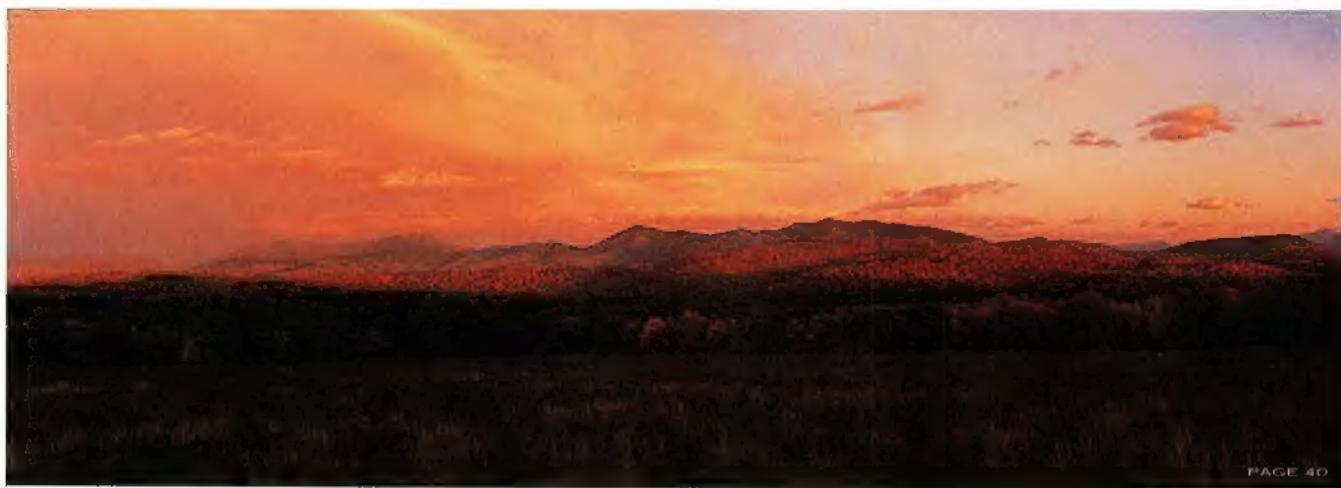
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Phantom Reductions

GARBAGE The Practical Journal for the Environment ISSN 1044-3061 is published bi-monthly for \$22 per year by Dovegate Publishers, The Blackthorn Tavern, 2 Main St., Gloucester, MA 01930. Telephone (508) 283-3200. Subscriptions in Canada are \$29 per year; payable in U.S. funds.

Second-class postage paid at Gloucester, MA and at additional entries. POSTMASTER: Send address changes to GARBAGE, PO Box 65159, Boulder, CO 80322.

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Getting the Lead Out

Old paint may be the biggest contributor to lead poisoning, but new studies suggest another source: Too often, there's lead in drinking water.

BY HANNAH HOLMES WITH BILL BREEN

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speaking for science

To Build A Bog

In theory, scientists can construct new wetlands to replace those that are buried and blacktopped.

In practice, it's not so simple.

BY BILL BREEN

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the real world

Is Garbage an Environmental Problem?

By historical and international standards, waste management in the U.S. is sophisticated and successful. So why are garbage issues presented as environmental problems?

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BEYOND THE PAIL

Soda-can pop tops no longer litter our sidewalks, but they are still buried in landfills. And they're a key in the pursuit to understand garbage.

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In the weeks after Hurricane Andrew, South Florida slash pines were the only thing left standing.

Now, more than a year later, ecologists are struggling to save them from total devastation.

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ASK GARBAGE

That curious film on blueberries; disposing of pressure-treated wood; saving with front-loading washing machines.

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IN THE DUMPSTER

Soooy!! Congressional science earmarks are nothing but pork, and we should call the pigs home.

Cover photograph by
Neal Farris

Back cover illustration
by Bonnie Timmons



Who Decides What You Know?

CONTROVERSY RAGES OVER A SERIES OF ARTICLES IN THE *New York Times* last March, written by respected long-time national correspondent Keith Schneider. Questioning environmental regulation, risk assessment, priorities, and costs, he opened the debate to nontraditional groups interested in environmental policy issues, including (in Schneider's words) scientists, property owners, town officials, business owners, public policy scholars, farmers, lawyers, and insurers. I didn't find the articles terribly controversial; they simply reaffirmed for me that the time has come for broader environmental thinking.

Turns out I'm in the minority (again). The furor continues. The question is, ostensibly: "Do the articles reflect a healthy journalistic skepticism, or flawed reporting methods?" Relevant enough, unless you're privy to the nature of the attacks.

On the phone with a member of the environmental establishment, I mention the *Times* articles, and am admonished that I mustn't take Keith Schneider seriously: He's been "blacklisted." I pick up the *SEJ Journal*, the newsletter of the Society of Environmental Journalists, where Mr. Schneider tells colleagues: "I have become a focus of malignant criticism from some members of the national environmental community and their allies in the press."

A trade newsletter, delighting in Schneider's "getting raked over the coals," suggested that a put-down piece on him be "required reading for environmental journalists." Sports Illustrated linked him with Rush Limbaugh. In print, a Sierra Club leader questioned his "personal agenda" and reported that he favored "gutting environmental regulations." An article in *E magazine* suggested that he is secretly

helping the petrochemical industry, and thus predicts "the end of his career as a serious writer."

The most egregious assault involved a letter sent to a senator by the famous head of an international environmental organization. The letter urged the senator to cut ties with a magazine for which Schneider had written a feature, warning that Schneider's "reputation as a news correspondent is in serious jeopardy."

Were this your first run-in with such character assassination, you might be tempted to think that where there's

smoke, there's fire. But how about the green-leaning editor who questions Bill Rathje's motivations, and thus called him "the much-discredited Dr. Rathje" in print — no explanation or attribution?

Or how about my experience on Internet? Last month, one section of the *GARBAGE* story on the ozone hole appeared on that computer bulletin board. The ensuing debate soon disintegrated into conjecture on my personal integrity, who or what finances *GARBAGE*, and what dastardly event might have coincided with the company's move from New York City to Gloucester in 1991.

"I regard this ferocious response as ... emblematic of a very serious problem in our field. I am seen not as a skeptical reporter but as a traitor," writes Keith Schneider in a silence-breaking editorial.

Intimidation, like censorship, affects what gets reported. And that affects what you know. ■



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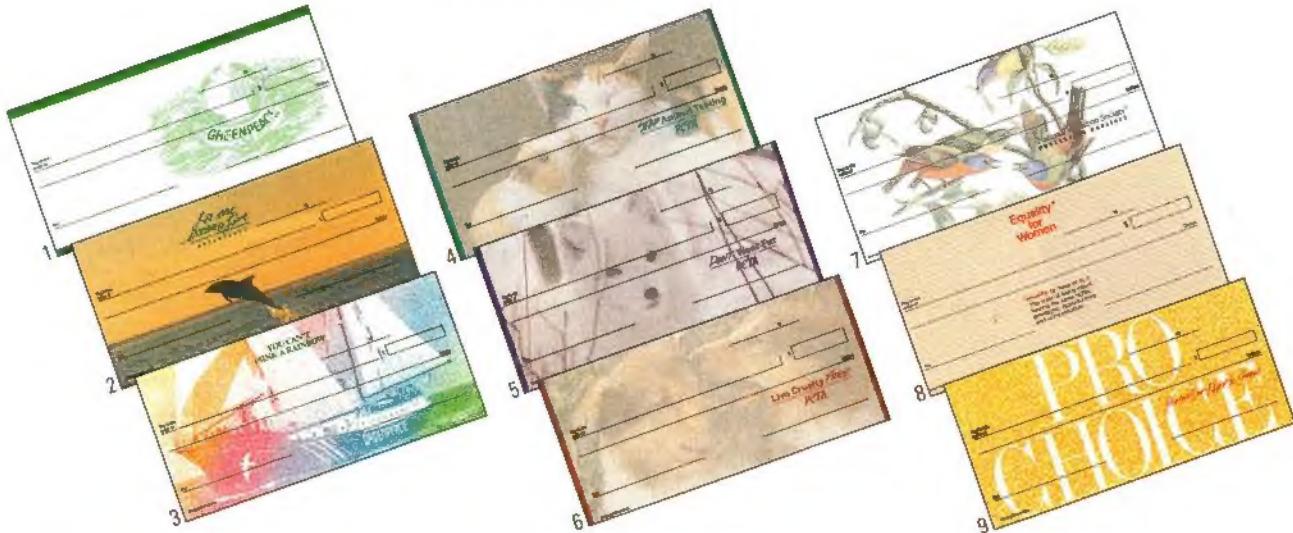
Steve Sawyer, Executive Director, Greenpeace Int'l.

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GARBAGE

The Practical Journal for the Environment

VOLUME V, NUMBER 5

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GARBAGE THE PRACTICAL JOURNAL FOR THE ENVIRONMENT is published by Dovetale Publishers, The Blackburn Tavern, 2 Main St., Gloucester, MA 01930. Telephone (508) 283-3200. Advertising: (508) 283-4721. Newsstand sales: (508) 283-3200. Letters to the editor and author's story queries should be sent to editorial offices, noted above. Publisher disclaims all responsibility to return unsolicited editorial and graphic matter. Letters to GARBAGE magazine and its editors become the property of GARBAGE. Articles appearing in GARBAGE are indexed in Environmental Periodicals Bibliography, Environmental Studies Institute, 800 Garden St., Ste D, Santa Barbara, CA 93101; (805) 965-5020.

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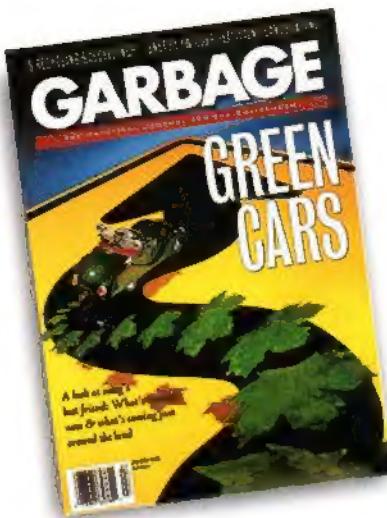
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Green Car Alarms

AUTHOR J. BALDWIN LAUNCHES INTO ELECTRIC cars by blasting the "hasty" adoption of a zero emission vehicle requirement ("Green Cars," June/July). What is so hasty about requiring those auto makers who have been promising us electric cars "soon" or "in five years" since the early 1970s to actually start producing a few in 1998, and more phased in by 2003? Get real! How long do we have to wait?

Also, he says no electric conversion can drive in Minneapolis in February uphill with the lights and heater on. That is not true where I live in the Washington, D.C. area, where the winters are not quite as cold as Minneapolis. True, it isn't possible for me to drive farther than 30 miles from home because my range is limited. But guess what: 90 plus percent of American car trips are shorter than that. Electric cars make the perfect around-town commuter car.

CHARLES GARLOW
Takoma Park, Maryland

WHILE J. BALDWIN'S ARTICLE DOES PROVIDE A good round-up of some of the more attractive alternative automotive energy sources available today, he seemed to discount the possibility of hydrogen due to technological obstacles. Frankly, he is wrong.

Two years ago Mazda debuted a fully functional concept car powered by hydrogen, [which] emits virtually nothing but water vapor from its tail pipe. Since the HR-X's introduction, we have developed

LETTERS

several prototype vehicles for fleet testing. So you see, hydrogen as a viable alternative energy is closer than many people think.

JACK PITNEY
Manager, Public Relations
Mazda Motor of America
Irvine, California

ON PAGE 28 OF YOUR JUNE/JULY ISSUE THERE is a paragraph on alternative fuels which states that "Ethanol in this country would probably be made from corn, a crop requiring vast amounts of water [and] a typical cornfield loses six tons of topsoil per year."

Corn is not considered the ideal crop for ethanol. The ideal crop is considered to be drought-resistant sorghum which will produce clean fuel for over-the-road vehicles. Ninety day experimental strains are being grown in Kentucky.

T.G. WALSHE
Hamden, Connecticut

I READ YOUR ARTICLE, "GREEN CARS," AND WAS pleased to see some reality brought to the debate. However, I was dismayed that your information on ethanol did not take into account the new directions the industry is taking.

While current ethanol capacity is based on grain feedstocks (corn and milo), upcoming capacity will be developed utilizing biomass, or cellulose, based on feedstocks (paper, wood, ag residues, specialty crops, etc.). In addition to utilizing wastes, many crops that are beneficial to soil conservation can be economically utilized as feedstock (switchgrass, Johnson grass, cane, etc.). However, don't rule out corn altogether. By using the corn stalk and CO₂, 2.5 times the amount of ethanol can be produced than that from the grain alone.

MARK E. CARVER
General Manager, Arkenol, Inc.
Las Vegas, Nevada

MR. BALDWIN RAISED THE UGLY SPECTER OF aldehyde emissions from using methanol. We wish that he and many others would look into the facts a bit more. All internal

combustion motor vehicles emit aldehydes, including formaldehyde. The California Air Resources Board has established a formaldehyde emissions standard for all motor vehicles.

The bottom line is that methanol is a much cleaner fuel than unleaded gasoline. For additional information on alternative fuels, contact our Drive Clean California Hotline at (916) 654-4602.

CLAUDIA CHANDLER
Assistant Executive Director
California Energy Commission
Sacramento, California

IT IS EASY TO SEE THE IMPROVEMENTS IN CARS concerning pollution control, but I fail to notice any obvious steps to mitigate the pollution created by trucks. What is being done about making trucks and other heavy moving equipment "green"?

VANESSA VOLIN
Decatur, Alabama

EINSTEIN SAID THAT WE ARE NOT GOING TO solve today's problems with the same kind of thinking that got us into them. A radical overthrow of urban transportation policy is needed, giving priority to pedestrians, bicycles, and public transportation.

ANNE HANSEN
Toronto, Canada

J. BALDWIN SAYS TO EXPECT SLOW [DEVELOPMENT OF ALTERNATIVES] UNLESS WE FACE ANOTHER CRISIS. IS THE SIGNIFICANT REDUCTION IN LUNG CAPACITY AMONG CHILDREN IN LA NOT CRISIS ENOUGH?

We are cutting butter with a chain saw. The modern steel car gets 300 miles between refueling and will move five tons. The average trip for a car is around 20 miles and the payload for a commute is about 150 pounds. In a world in which resources need to be used efficiently, we cannot continue to use technology and products that have this kind of overkill.

Name withheld at writer's request
Boulder, Colorado
[continued on p. 10]

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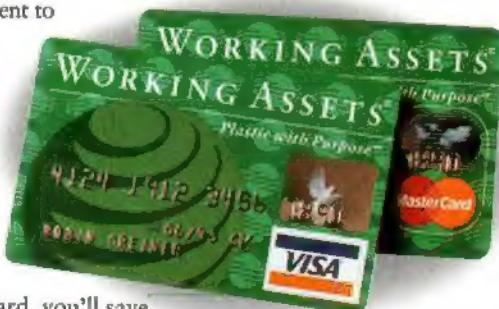
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—David Papineau,
New York Times Book Review

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GRADUALISM — HYPERED BY THE AUTO INDUSTRY and tacitly approved by J. Baldwin — means a 40 mpg car, not the 150 mpg car he mentioned. A 65 mph top speed car would cut the 150 mpg to less than 70 mpg. At present it would require a diesel engine or a high compression Otto cycle CNG engine.

CNG could be practical now except for outdated governmental pressure vessel requirements. Engines that would achieve this goal using gasoline and having negligible pollution could quickly come about if individuals and not auto bureaucracies were funded by the government.

CLARE A. ALDRICH
Thousand Oaks, California

"GREEN CARS" IMPRESSED US WITH ITS RATIONAL and fair appraisal of the energy (gasoline) situation with respect to environmental concerns. The author is neutral in the arguments between the auto industry and the environmental people, feeling that his science should only tell the facts.

ROSALIND CLARK
Manager, Rosalind Press
Las Vegas, New Mexico

Recycle Your Attitude

YOUR ARTICLE ON THE MACMILLAN BLOEDEL recycled newsprint mill proposed for California makes an excellent point: both the environment and the local economy suffer when we ship our old news to be recycled in Asia and the Pacific Northwest. However, you seem to have completely fabricated the position of Californians Against Waste and other "enviros."

We would never "reject local enviros" environmental objections. As much as we support the mill in concept, we have always been in complete agreement with local enviros that the mill should "be held to the same standards as any other heavy industry."

It is true that we want to see a constructive, problem-solving approach to siting enviro-sustainable industry such as recycling mills — but this case has become mired in the traditional adversarial paradigm. Both the enviros and the mills need to recycle their attitudes — but the enviros can't, and shouldn't, do it alone.

SANDRA E. JERABEK
Executive Director
Californians Against Waste Foundation
Sacramento, California

Our story quoted Ms. Jerabek saying: "Environmentalists can no longer afford to be anti-industry. Yes, a plan for dealing with water emissions needs to be hammered out with the company. [But] this mill is absolutely vital for California recycling."

How that differs from the sentiment expressed above is unclear to us.

— The Editors

I READ WITH INTEREST YOUR ARTICLE ON THE controversy surrounding the proposed newspaper recycling plant in West Sacramento, Ca. ("Enviro Fight Recycling Plan," Sept/Oct). I think you've grossly oversimplified this issue. Opposition to the mill can't simply be attributed to anti-industry sentiment in the environmental community. Some residents have a right to question whether the proposed plant is the type of neighbor they want.

As a recycling coordinator, I recognize the advantages this proposed mill would bring to our efforts to increase recycling in California. But the very real problems associated with a development need to be resolved, and opposition should not be dismissed as knee-jerk NIMBYISM.

DAVID M. WADE
Recycling Coordinator
USC Housing Services
Santa Cruz, California

CONGRATULATIONS ON YOUR EXCELLENT ARTICLE "Is Recycling Succeeding?" (June/July). You are correct that recycling was first promoted as a means to save landfill capacity, but it now has taken on a "save the planet" mystique. Of course, we cannot save the planet by doing uneconomical recycling, but in this game, perception is reality.

Thanks for helping us take off the rose-colored glasses. Markets, not bureaucrats, should provide the answers as to which materials in the msu stream are not savers of resources when recycled.

KENNETH W. CHILTON
Deputy Director

Center for the Study of American Business
St. Louis, Missouri

BILL RATHJE, A.K.A. THE INDIANA JONES OF garbage, makes some interesting observations regarding Tucson's trash ("Beyond the Pail," June/July). Lest your readers make too much of a [continued on p. 12]

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water a year. And, it uses only a third of the detergent and bleach.



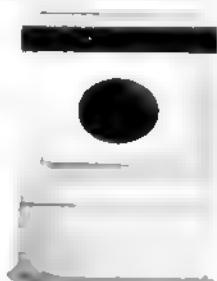
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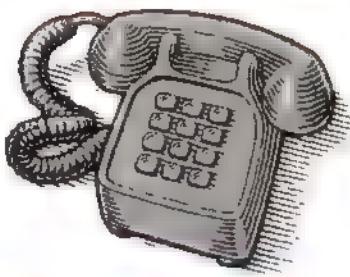
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one-city peek inside "Joe six-pack's" GARBAGE can, please allow me to point out there is no evidence that beer cans are recycled nationally at a different rate than those for soft drinks. When consumers recycle, they do not care whether the aluminum can held a malt beverage or a soft drink.

Also, there is no way to determine what amount of PET containers recycled nationwide come from deposit states. What is known: The last bottle bill passed in 1982, when the PET recycling rate was less than 18 percent. Last year, the rate was 38 percent. The increase is due to non-deposit recycling programs.

E. GIFFORD STACK
V.P. Environmental Affairs
National Soft Drink Association
Washington, D.C.

Flora & Fauna

I READ WITH INTEREST YOUR ARTICLE "THE FINE Art of Mulching" (Sept/Oct). However, in the section on carpet mulching, I was appalled to read that the author prepared the ground by "simply weed-whacking all the poison oak...". As a registered nurse and a poison-oak sufferer, I know this to be very hazardous for any person susceptible to poison oak/ivy.

My worst case of poison oak occurred from inadvertently cutting the stems of poison oak with a weed-whacker during the winter dormant period. Breathing the volatile oils caused a week of shortness of breath, nausea and vomiting, and diarrhea. Both my physician husband and I would recommend against using a weed-whacker for poison oak removal!

DARLENE CHIRMAN, R.N.
Davis, California

YOUR "GARBAGE DICTIONARY" (SEPT/OCT) entry on charismatic megafauna made a valid point and raised some interesting questions. However, as in most things ecological, it's not quite as simple as it appears. One reason many biologists and conservationists concentrate on large, charismatic species is that their conservation, of necessity, requires the conservation of the larger ecosystems that support them. In the process numerous other, less charismatic species are also saved.

Top predators such as panthers and wolves are able to bring many species into the embrace of legal protection on their coattails. These "coattail species" are the beneficiaries of the general interest in the more attractive large species. If we concentrate our energies on saving entire ecosystems, we turn every living thing in those ecosystems into a coattail species. Including ourselves.

RICK SULLIVAN, Ph.D.
Center for Environmental Study
Grand Rapids, Michigan

GARBAGE is Good For You

THE NUMBER OF KNEE-JERK ENVIRONMENTALISTS cancelling their subscriptions to your magazine because they see you straying from the one true path has moved me to write. As you have pointed out, there are no simple answers. Everything we do generates waste, and everything has a trade-off.

ELIZA WALBRIDGE
Flagstaff, Arizona

I AM A DEER HUNTER AND AN ENVIRONMENTALIST, and, quite frankly, I'm tired of hearing from all the zealots proclaiming the righteousness of their own cause. We are all in this together, and there are no rules defining who can or can't be an environmentalist. We should teach people to think for themselves instead of learning to repeat some sort of knee-jerk slogan from someone else's bumper sticker.

JEFFREY J. OLIVER
Binghampton, New York

ENVIRONMENTALISTS WHO CRITICIZE GARBAGE for presenting an alternative idea on an issue are no better than those that believe there are no problems to begin with. The way to make informed decisions is to research issues yourself, and GARBAGE is as good a guide as any to be found.

DAVID SUTHERLAND
Ottawa, Ontario

WALKING CHEERFULLY ALONG THE FENCE, AS YOU have chosen to do, will assure air too dirty to breathe and polluted groundwater supplies. It will assure that DuPont and other giant corporate polluters will have yet another platform. Taking a stand is a [continued on p. 14]

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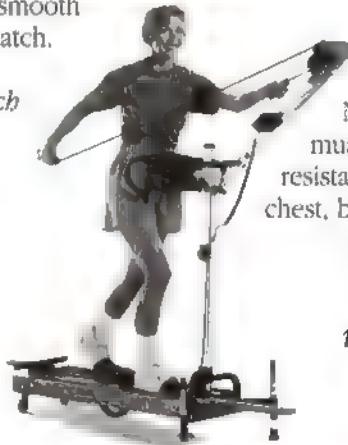
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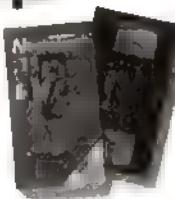
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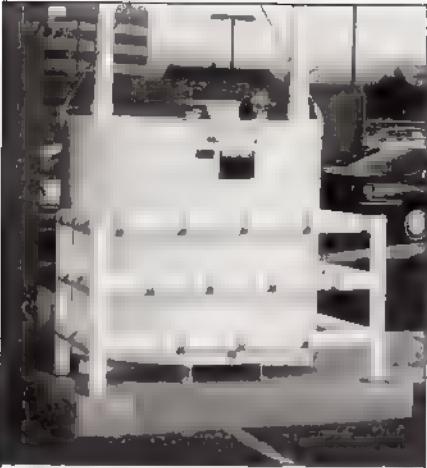
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struggle and not rewarded in this society. But sitting on the fence is far worse, and a very crowded place to spend your days.

ARIENE LODAHL
Duluth, Minnesota

HERE'S \$21 TO DOUBLE THE LENGTH OF MY SUBSCRIPTION. Maybe it will cancel out the loss of some offended subscriber who canceled in pique because you published data that they didn't agree with.

Eco-evangelism by those who "don't care what the data says" creates great mischief. Ultimately, it destroys the very credibility of making the environment an issue. Courage needs money to survive over the long haul. I'd encourage others to advance their subscriptions ahead of time.

DONALD E. CHAMBERS
Lawrence, Kansas

MY ADMIRATION FOR YOUR MAGAZINE GROWS with every issue. GARBAGE has evolved from an excellent read to a must read. Keep up the good work.

PETER D. KINDER
President, KLD & Co., Inc.
Cambridge, Massachusetts

JUST WANTED TO SAY WHAT A PLEASURE IT IS TO see your "against the grain" reporting in recent issues. Stick to the facts; that's what it's about and you're to be commended for following that journalistic principle.

PETER SPENCER
Editor, Consumers' Research
Washington, D.C.

CONGRATULATIONS. I THINK GARBAGE IS A GOOD publication getting better. As an opinionated fanatic, I of course have many axes to grind and oxes to gore. But I have been delighted to have been "brought up short" by a number of articles and forced to rethink and re-examine long held views.

JUDITH FREED
Pacific Palisades, California

A NEW GROUP OF "ECO-UTILITARIANS" HAS awoken, and GARBAGE is at the forefront. Unfortunately, too few of the policy-makers dealing with environmental issues have been trained in the scientific process. Many of these people become emo-

tionally attached to their pet issues and associate the success or failure of a project with their personal success or failure. Maybe GARBAGE will alert the people who appoint these policy analysts to the benefits of true science.

RICHARD JAMAIL
Chemical Engineer
Arlington, Virginia

I DO NOT EXPECT, NOR DO I WANT, A "POLITICAL-ly correct" position which supports my own ideas. It is my belief that you take your positions not to sell more copies or maintain your advertising income, but to inform.

CHARLES E. SULLIVAN
President
The Sullivan Group Architects, Inc.
Minnetonka, Minnesota

I LOVE YOUR MAGAZINE AND PRAISE YOUR HONEST STANCES. Environmentalism as religion is a stance we can ill afford, and it's good to see you bravely bucking it. You have my vote.

A.C. SMITH
Basking Ridge, New Jersey

IF EVERYONE IS MAD AT YOU, YOU MUST BE doing something right. You're challenging people's perceptions and beliefs. We constantly need to rethink our attitudes and convictions about what is going on around us. Thank you for keeping us on our toes.

PAULA RAINES
Salt Lake City, Utah

CONGRATULATIONS ON ACHIEVING WHAT many have said is impossible — a sane, rational approach on environmental issues! Many of the topics you cover are controversial, but you confront them head on.

Being involved with my community's grassroots environmental group, as well as working as an environmental manager in industry, I am aware of the variety of viewpoints concerning many of today's "hot" topics. The treatment of such topics in GARBAGE is always factual and well-balanced, with all sides fairly represented. While I might not always agree with what you say, I know all sides will be considered and not ignored.

JOYCE M. VALLANCE
Floyd Knobs, Indiana

Lifting the Lid

INFO-TECH

The Paperless Newspaper

PICTURE THIS: A COMPUTER THE size of a magazine, and about as thick. Most of the surface is taken up by a color LCD screen that displays text, photos, and graphics as sharply as if they were on a printed page. Plug it into a docking station at night and it automatically downloads your daily newspaper; in the morning, you unplug it and take it with you.

The tablet displays what looks like a typical front page, along with a menu of options for selecting inside features. Touch a photo and it turns into a 15-second video clip, complete with sound. Touch a restaurant ad, and a cellular link lets you make reservations while you're sitting at the bus station. Or tell the tablet to use its sound chip to read you the day's top stories during your morning drive. Offended by a story? Scrawl a message with your electronic stylus and post it on the newspaper's public bulletin board.

Is this the newspaper of the future? Roger Fidler, head of the Knight-Ridder Information Design Laboratory in Boulder, Colorado, thinks so. For a variety of reasons — technological, economic, and environmental — Mr. Fidler believes the newspaper as we know it will wither away during the next 10 to 20 years, to be replaced by electronic tablets that will

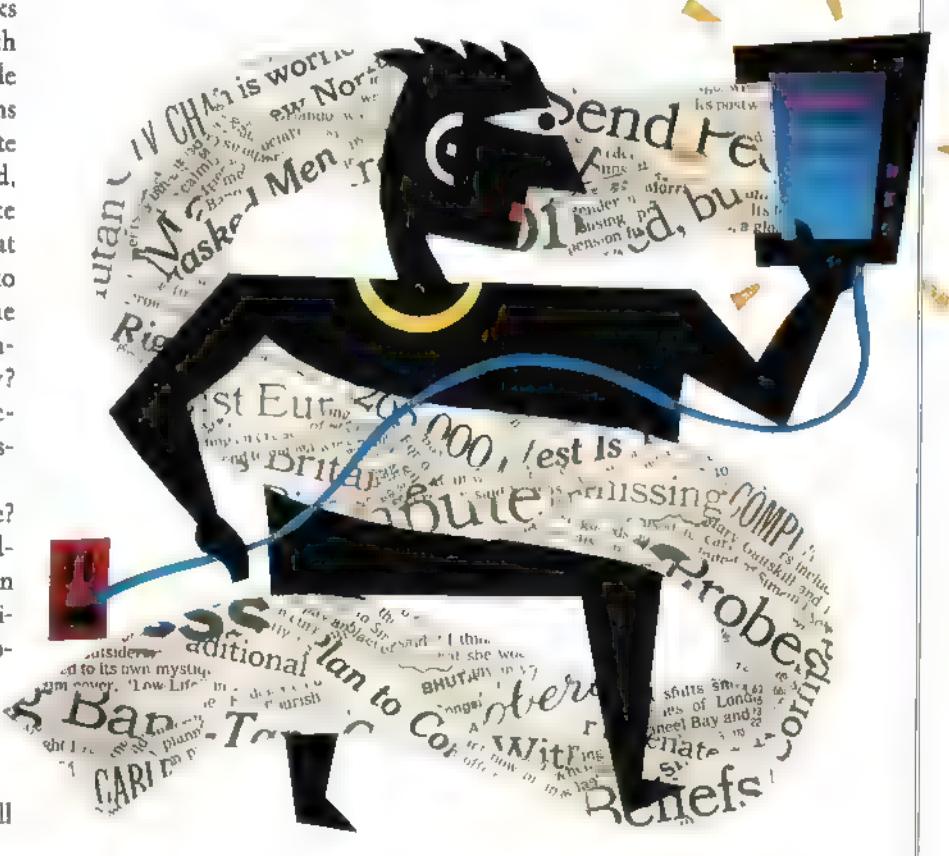
become so cheap they'll be given away as promotions.

The economic incentives are clear: 50 to 60 percent of a newspaper's costs are tied up in manufacturing and distribution. The tablet could be a far cheaper way of fulfilling the newspaper's traditional job of providing information. "The paper is merely the wrapper of that information," Mr. Fidler says. "It's not the wrapper you're

buying. It's the content."

As a new generation of readers comes of age, Mr. Fidler believes the newspaper will have to change — not just to provide the technological razzle-dazzle and interactivity these readers will expect, but also to allay their environmental concerns.

Go to any community's recycling center and you're likely to find a bin overflowing with newspapers. It's a problem that won't go away, since the market for recycled newspapers is limited. The stuff can be used to make boxes, wallboard, even automobile parts. [Continued on p. 17]



Flying High with Father Goose

A WOBBLY ULTRALIGHT AIRPLANE trundles down a hill and buzzes across a field. Feet flapping and wings optimistically outstretched, the geese follow. At the end of the field the plane turns and sputters to a stop. Those birds that managed to pump themselves a few feet off the ground tumble down.

"You did great!"

years that he figured out how to do it: He learned to build and fly airplanes and he gathered some goose eggs. Now Bill hopes to demonstrate that young birds can be led across the skies to reestablish migration routes that died with older birds.

When a bird stumbles forth from its egg, it will attach itself to the first likely parent it sees, a process called "imprinting." When Bill's Canada geese hatch each May, they are confronted with the rather unlikely



You did great!" whoops the pilot, a tall man with a tousle of gray hair and beard. Father Goose is exercising his flock.

Ever since he was a boy, sculptor Bill Lishman, now 54, has wanted to fly with the birds. It's only in the past few

picture of a man with a tape recorder that emits the buzz of an ultralight airplane engine. Goose boot camp begins almost immediately.

The fuzzy yellow goslings start their young days with a jog — Bill in the lead, lugging the tape recorder and perhaps accompanied by one of his three children. "C'mon, geese! C'mon, geese!" he puffs, as they peep and chug through tall grass and over logs.

By mid-July the birds are starting to look like adults, with sleek black

necks and white throat-bands replacing the fuzz. And they're ready to start beating their wings. Bill prepares them by pushing his plane around the field, calling the geese to follow. Often, they're reluctant to obey this gawky new parent. A few at a time, though, fall in line behind him. As they get stronger, their races behind the ultralight become little hops of flight.

By mid-August, the birds are strong enough to follow the ultralight into the sky. The footage in his "C'mon Geese!" video is astonishing. The birds straggle behind the plane at first, but as the days go by they learn the tricks of the flying trade. The precocious birds discover that if they position their bodies just so, they can "surf" effortlessly over the airplane wing's leading edge. They figure out the dynamics of the V formation — the lead bird (or airplane) breaks the way, working hard while the others ride the wake. When the leader tires, he drops back and another bird comes forward. They honk incessantly to keep themselves in order, a tradition Bill tries to honor in flight, bellowing encouragement to them over the engine's roar. After an exciting early flight, the geese cluster around the parked airplane and nibble at it excitedly.

Over the years, Father Goose has raised and trained three families of geese. Although he was prevented by Canadian/U.S. red tape from actually migrating in previous years, his hopes are high for a 1993 trip to Warrentown, Va.

Bill has no idea how long it will take to migrate. In fact, precious little is known about goose habits, like how fast they prefer to fly, how often or long they like to rest, or even whether they'll agree to cross Lake Ontario without stopping for a splash. In Virginia, the birds will winter with Dr. William Sladen, a swan expert and the project's bona fide scientist. Come spring, Bill will fly down and fetch the flock home. The next fall, the theory goes, the geese

will migrate on their own.

Despite his patience and effort, geese are kind of beside the point. "The geese are just being used as guinea pigs," says Bill. "We hope that what we learn can be used to restore flocks of [endangered] trumpeter swans and whooping cranes."

Loss of habitat, predation, disease, and hunting have driven those species out of their migratory destinations. Just one flock of whooping cranes winters in the U.S., near Corpus Cristi, Texas. Migratory routes are learned, not instinctual. When the adult birds die out their routes do, too.

While it may seem unlikely, there are other migration experiments underway. In one, researchers seeded sandhill crane nests with whooping crane eggs. The sandhills did teach the whoopers to migrate. One problem: The whoopers now consider themselves sandhills and won't mate with other whoopers.

Among those intrepid souls who are attempting to restore wildlife populations, Bill Lishman is the only one who's taking the airplane approach. He says he wakes every morning wondering if he'll crash. Other challenges to the airplane method — especially in more remote habitats — include getting over mountains and his birds leaving him for another plane.

As migration day nears Father Goose spends more time aloft, admiring his flock's progress.

"It's totally addictive," he says of his fanciful flights. "You're in a three-dimensional world up there, with these birds that have been flying long before we were even crawling. It's absolutely fantastic."

— Hannah Holmes

FOR A COPY OF THE VIDEO "C'MON GESE!", SEND \$32.95 TO: EAA, DEPT. MO, P.O. BOX 3085, OSHKOSH, WI 54903-3086; (800) 843-3612.

[Continued from p.15] but turning it back into newspapers is expensive and difficult. Newspapers comprise 10 to 18 percent of the volume in a typical municipal landfill, according to the Garbage Project. And it keeps on coming; the Newspaper Association of America says U.S. daily newspapers used almost 20 billion pounds of newsprint in 1992, at a cost of about \$6 billion.

The first stirrings of the electronic-newspaper revolution are already being heard. For the past decade some of the biggest newspapers have been available on CompuServe, an on-line service whose high fees limit it largely to corporate users. But now user- (and wallet) friendly versions of the Chicago Tribune and the San Jose Mercury News are on America Online, and papers ranging from the Los Angeles Times to Long Island's Newsday to the Atlanta Journal and Constitution are coming to Prodigy.

Because these services can be used solely with personal computers and modems, they're hardly the mass medium Fidler envisions. (Although Prodigy is investigating hook-ups to cable TV.) But they're already saving newsprint, as users can choose additional information on-line to supplement stories that appeared in the morning paper.

Of course, the electronic landscape is littered with broken promises, from the "paperless office" to the videotex services of the 1980s, on which a number of newspaper companies — including Mr. Fidler's — lost a pile of money. Media observers say the electronic newspaper can work if the industry focuses on content and ease of use — but they nevertheless voice some skepticism.

Mark Thalheimer, a technology expert at Columbia University's Freedom Forum Media Studies Center, for instance, says publishers must resist the urge to use every bit of data they have simply because they're no longer constrained by paper considerations — a phenomenon he calls "shovelware," and

For the Record

"I'm all for conservation, but I'd like to club the little bastards."

— Landowner Frank Rigbelin, who said that after the endangered golden-cheeked warbler was discovered on his Austin, Texas, property, "its value plummeted."

(U.S. News & World Report, Oct. 4, 1993)

which he says is a particular problem with CD-ROMs issued recently by the major news magazines.

Mark Jurkowitz, media critic for the Boston Phoenix, is skeptical that the industry will stay focused on developing an electronic alternative once the current newspaper recession ends. "You get the sense that, intellectually, newspapers understand this is where the future lies, but emotionally and psychologically they're still very much immersed in tinkering with the newsprint product," he says. Indeed, Tonda Rush, president of the National Newspaper Association — which represents nearly 5,000 weeklies and small dailies — believes "the addiction to paper is going to last another generation, if not more."

But Roger Fidler is a persuasive advocate. The technology, he notes, is simply going to be too good to keep down. "We're going full circle, back to the days of the portable clay tablets" he says. "It does not mean the death of newspapers. It means the evolution of newspapers from one medium to another."

— Dan Kennedy

Dan Kennedy is news editor of the Boston Phoenix. He writes frequently on information-technology issues.

Enviro-Mental Sickness

PEOPLE WHO SAY THEY suffer from "multiple chemical syndrome," also known as environmental sickness, are no more likely to have immunological problems than people visiting the doctor's office with routine muscular injuries, according to a study published in the July 15 issue of *Annals of Internal Medicine*. Researchers did find, however, that the chemically sensitive were far more likely than the injured group to suffer from psychological problems such as anxiety and depression.

The results did not determine whether psychological distress was the cause or result of chemical sensitivity. But the authors did suggest treating psychological problems before prescribing the severe chemical-avoidance lifestyles that many people with the syndrome pursue.

Media-ocracy

WHAT CAUSES CANCER? YOU'LL be led to the wrong answers if you rely on media emphasis, according to a recent study funded by private foundations and conducted in part by a non-profit research organization called Center for Media and Public Affairs. The study examined 1,147



stories in major media outlets between 1972 and 1992. Then researchers polled 401 scientists drawn from the ranks of the American Association for Cancer Research.

The scientists listed tobacco smoke (including secondhand smoke), poor diet, excessive exposure to sunlight, and chemicals in the workplace as the top causes of cancer. In the

media, however, while tobacco smoke was the second most mentioned cancer causer, manmade chemicals ranked first, with food additives, hormones used as drugs, pollution, and manmade radiation (medical/dental) also in the top slots — all factors fairly low on the scientists' list.

The Times They Have A'Changed

THE WASHINGTON POST reports that one Friday evening this past summer, U.S. Interior Secretary Bruce Babbitt was seen hustling to get to a Grateful Dead concert on time. EPA chief Carol Browner said she had wanted to go to the show, too, but couldn't make it because her son had a fever.

The Scent of Power

WHILE ARKANSAS' PUBLIC image has been on the rise since her native son took office, "the natural smell of Arkansas" doesn't necessarily conjure pleasant associations for everyone. Nevertheless, Aromatique, an Arkansas-based fragrance company, recently introduced a new potpourri that is supposed to evoke the Arkansas landscape (sans chicken farms).

"The Natural State" fragrance pouch received a big send-off in Washington when it was introduced this past summer and several Arkansans in the executive branch (not, however, the boy from Hope)



stopped by at a reception at the Ritz Carlton.

What smells are those powerful Arkansans supposedly nostalgic for? Cotton pods, mushrooms, and black walnut shells are among the constituent nose ticklers. (One dollar from each purchase will go to the Nature Conservancy.)

This Just In...

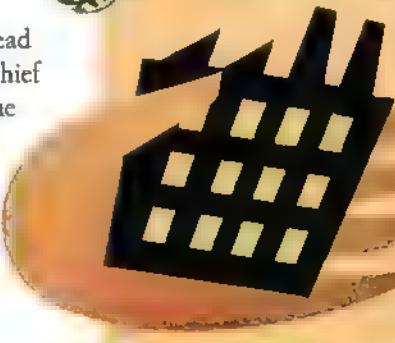
Trading Pollution

PLANS TO BUY AND SELL POLLUTION RIGHTS ON THE CHICAGO BOARD of Trade have been slowed due to EPA computer glitches.

Meanwhile, several aggressive brokerage firms are stepping in to create their own off-exchange market in pollution allowances. Some firms broker direct deals between companies. Others buy first, then look for somewhere to sell.

Enviro's are also getting into the act. The San Francisco phone company Working Assets Long Distance encourages its customers to round up their phone-bill payments to the nearest dollar. Excess payments will go to buy air-pollution allowances — which Working Assets will then take off the market forever.

The new National Healthy Air License Exchange (INHALE) is working to entice companies to donate excess permits to the group. Companies can then deduct the donations from their taxes. INHALE (216) 575-6040; Working Assets: (800) 788-8588.



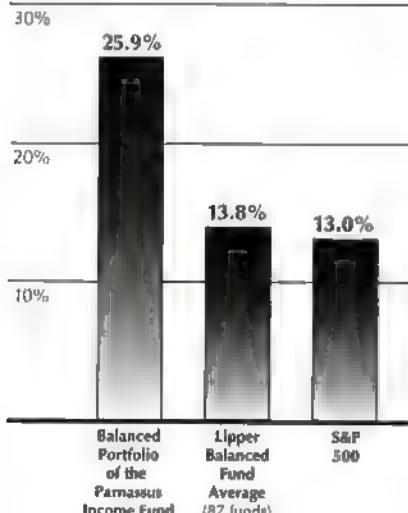


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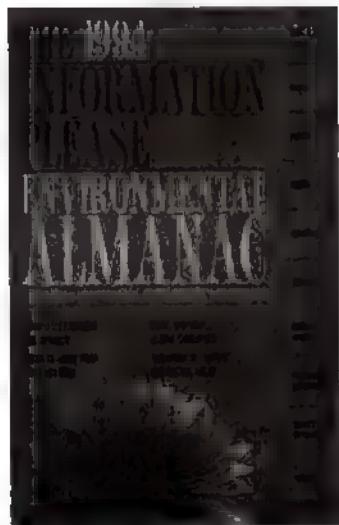
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The Garbage Index

ROAD WORK

Length of U.S. Forest Service roads crisscrossing National Forests: **369,000 miles**
 Length of Interstate Highway System: **43,000 miles**



PUSHING PAPER

Number of lawyers in the nation: **780,000**
 Average annual quantity of paper consumed by each lawyer: **one ton**
 Number of sheets of paper filed annually by California lawyers: **293,776,455**
 Pounds of paper thrown out of windows in the San Francisco financial district offices New Year's Eve, 1992: **40,000**

GREEN FOR RECYCLING

Amount McDonald's spent over the past year to purchase recycled products: **\$200 million**
 Amount the Commonwealth of Massachusetts spent over the past year to purchase recycled products: **\$2.8 million**

SUDS 'N SPUDS

Portion of beer containers returned in New York State over the past year: **81.5%**
 Amount New York State's beverage distributors have collected in unclaimed deposits since passage of the state's '83 bottle bill: **\$680 million**
 Pounds of potatoes in Aroostook County, Maine, that rotted after the 1992 harvest: **one billion**
 Estimated number of cows it would take to eat that much in a year: **60,883**
 Pounds of those potatoes that were composted: **20 million**

Sources: U.S. Forest Service; U.S. Dept. of Transportation; American Bar Association Journal; Sierra Club Legal Defense Fund; City of San Francisco; McDonald's Corporation; Massachusetts Dept. of Environmental Protection; Composting, Biocycle

"The Great Fluoride Fight" (May/June '92)

A National Research Council report released this past August concludes that fluoride does not pose a health risk at the levels allowed in drinking water.

The NRC supports the EPA standard of 4 parts per million of fluoride in drinking water and said there "was no credible evidence that the chemical causes cancer, kidney disease, or birth defects." The panel did call for continued study to determine if a lifetime exposure to low levels of fluoride could be harmful. The NRC cited some gaps in available data and said the EPA standard should be considered an "interim standard" until more research is done.

Raise a glass to a skeptical scientist in a lab coat and a more skeptical hat, leaving the table.

The Great FLUORIDE Fight

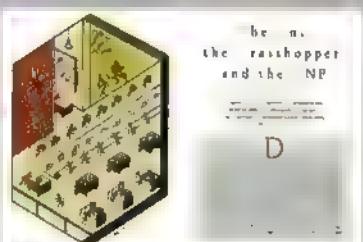


"The Ant, the Grasshopper, and the GNP" (Feb/March '93)

Deep in the hallways of the U.S. Department of Commerce, a relatively obscure cluster of economists is preparing to revolutionize the way the United States gauges its economic worth. The Bureau of Economic Analysis is creating what it calls a Green Gross Domestic Product.

The idea beyond the Green GDP is the same idea we discussed in our article: Some economists contend that intangibles such as clean air, clean water, and the nation's biodiversity should be factored into economic measurements. Only a green GDP, they say, can give an accurate measure of the nation's true worth.

The BEA is starting with an accounting of the nation's mineral reserves, a somewhat easier task than, say, counting and assigning value to the reserves and use of clean air. Devising a truly green GDP will require significant advances in the collection of a broad range of raw environmental data. And it will take some time to figure out how that data relates to standard accounting practices. (For example: Should the depletion of a non-renewable natural resource such as copper be counted as a reduction in inventory or a depletion of fixed capital?) The BEA is due to issue an initial report on non-renewable resources by next spring.





A Pop(top) Legend

IN THE ANNALS OF GARBEOLOGY, ONE NAME STANDS OUT: ERMAL Fraze. No wonder. Ermal invented one of our society's most widely recognized icons, the pull-tab pop-top. There, in one small but potent scrap of aluminum, is mid-century America's unbridled devotion to creativity and convenience. The pull-tab is also a significant boost to the science of garbology.

The legend was born on a hot Ohio day in the summer of '59. Ermal and his family were about to enjoy a luscious picnic when their idyllic outing fell on its face. The beverage cans were chilled, but Ermal had forgotten to bring the one indispensable tool of the day — a "churchkey" can opener. Gut-wrenching despair! Dad was eventually reduced to prying the cans' lids off on his car bumper.

In a similar situation, the protagonist of the '90s movie "Falling Down" went on a rampage. Ermal, however, followed the spirit of his times and set about correcting this flaw in the system. By 1963 he had patented the pull-tab pop-top that made him a fortune on its way to becoming a hallmark of American life.

The story picks up again in 1977, when I assigned my sophomore archaeology class to study the detritus left behind at a drive-in theater by movie-goers. While drive-in cleanup crews removed cans, bottles, cups, wrappers, and other visible debris each morning, they invariably left behind bottle caps and pull-tabs. After a few years, these neglected throwaways carpeted the whole drive-in. The class decided to use the nicely labeled bottle caps to determine quantities of soda and beer by brand. Assuming that the brand distribution in cans was the same as in bottles, we'd collect the pull-tabs to determine the ratio of bottles to

cans that people brought with them to drive-ins.

Each student was assigned a speaker post and tethered to it by a length of rope. Then, on hands and knees, they picked up and bagged all the artifacts they could reach. Every student, that is, except one young woman, whom I noticed sitting against her post staring at her hands. I walked quickly over to encourage her to take a more active role.

"How's the surface collection going?" I asked.

"Have you ever looked at these things?" she responded as she held two

pull-tabs out in my direction.

"Yeah, fascinating!" I exclaimed as I got down on all fours. "Let's pick up a few more to look at."

"Why are there so many different kinds?" she asked.

I stopped collecting, sat down, and stared at the pull-tabs in my hands. I held eight, and all were slightly different. The most distinctive pull-tab had two small holes in the base of its pull-ring above the flange. The second one was light gold colored on its top side, but silver on its bottom. It had no grooves in the pull-ring, as many others did, and no holes.

I was shocked! I hadn't known that there were different kinds of pull-tabs, much less why. Within a few minutes, everyone in the class was sitting and staring down at the tiny artifacts in their hands.

On the way home, I stopped at a convenience store to rummage through their beverage cooler. I found the pull-tabs with two small holes on Coors beer



cans, and the ones with light gold fronts and silver backs on Michelob. Eureka! The different pull-tabs correlated to different brands of beer and soft drinks. Within days, the Garbage Project had built a pull-tab typology for Tucson, Arizona.

But what was the typology good for? It didn't take long to determine that just as the final resting place of pull-tabs was widely separated from cans in drive-ins, the same was often the case at home. A few people dropped pull-tabs into their cans, but the vast majority threw them into the garbage separately. This was a classic example of the McKeller Principle in archaeology: Items that are used together are often treated separately as refuse if they are dissimilar in size. The implications were stunning: Even when responsible citizens took their cans to recycling centers, Garbage Project sorters could still find tell-tale tabs to indicate what beverages had been purchased. Thus, we could track the rise and fall of beer brands and consumption levels as well as the cola wars within household refuse. (See "Beyond the Pail," June/July '93.)

But every silver lining has a cloud. The very same separability from cans which made pull-tabs a boon to garbage sorters also made pull-tabs a public enemy. Parents worried that children might swallow them. And just as at drive-ins, pull-tabs began to pile up along sides of streets and roads, over parking lots, around schools, across parks — archaeologist Stan South once used the density of pull-tabs to determine the relative popularity of different campsites and trails. So, during the early and mid-1980s, pull-tabs were replaced by push-pull pop-tops, which generally remain attached to their cans (except for those drunk by people with moustaches, who often prefer to pull the tabs off completely).

For sorters of fresh garbage, the glory days of easy brand identification are gone forever. But for garbage archaeologists, those silent tell-tales will continue to inform, forever retrievable from the insides of landfills. ■

Archaeologist Dr. William L. Rathje is founder and director of The Garbage Project, and professor of anthropology at the U. of Arizona-Tucson.

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In a Hurricane's Wake

MORE THAN A YEAR AFTER HURRICANE ANDREW'S ORGY of destruction, ecologists say the wild lands of South Florida's Dade County are still reeling from the devastation. The region's native plants and animals evolved over many millennia to bounce back from hurricanes. But they have been so badly damaged by human tampering that, today, their recovery remains in doubt.

The fate of the famous South Florida slash pine tree illustrates the insidious effect of human pressures combined with a natural disaster.

Once so widespread that the species was nicknamed "Dade County pine," the red-barked, resinous tree thrived where few others could scrub out even a marginal existence. The pines covered all the dry ground in the southern half of the county, an area roughly half the size of Rhode Island. But they went under the axe to build the homes of turn-of-the-century pioneers and surface corduroy roads across interior swamplands. With the drain-and-develop-it boom of the 1940s and '50s, logging accelerated dramatically. By the mid-1980s, 90 percent of the trees were gone. Perhaps 3,000 acres worth survived in small, isolated patches south of Kendall Drive, a major suburban highway, but the stands were cut off from one another by freeways and subdivisions.

One week after the hurricane struck in August '92, a cluster of naturalists stood on a rooftop at a South Dade estate, surveying the vast expanse of wreckage. They found one glimmer of hope.

"All we could see were pine trees," recalls biologist Joe Maguire of the county's Department of Environmental Re-

source Management. "The place was a pineland again."

A year later those trees are dead, devoured by a half dozen different species of pine bark beetles and pine weevils.

The pines and the beetles are not new enemies. The insects have always infested the pines, naturalists say, but Hur-

ricane Andrew spawned a beetle epidemic.

"Right after the storm all the pines were bent over like fishing poles," recalls Parks Department naturalist Roger Hammer. "Over the months it took them to straighten out, the sap was cut off. They couldn't get water or nutrients."

The beetles took advantage, drilling rows of tiny holes that girdle the trees, laying eggs in the tender inner bark where the nutrients travel. The hatchlings ate more flesh. A fungus followed the beetles, cutting off the flow of water from the roots.

Historically, the trees fight back by drawing up extra water to make sap that coats and kills the beetles. But drainage and development have lowered the water

To re-create South Florida's slash pine forest, which was destroyed by Hurricane Andrew, botanist Bill Theobald begins by collecting seeds.



table so much that "the roots can't reach it in time of need," says state forestry biologist Bill Miller. "The trees literally died of starvation and thirst."

In the old days, the death of the big trees spelled opportunity for pine saplings to shoot skyward, but now the saplings are crowded out by human-introduced, invader species. "What we have left is cut-over forest," says Mr. Miller. Loggers had already taken the best pines, leaving skinny, stunted, or sickly trees. The storm hit "an inferior forest with lower resistance [to infestation]," he adds.

Biologists worry that if the last pines die, a living library of untapped botanical knowledge will die with them. What genetic quirks allow them to grow tall in blazing heat and bad soil? And what about the 241 other plant species known to live in the canopy's shelter, dozens of them so precisely adapted to local conditions that they grow nowhere else?

If the tall trees are to survive into the 21st century, botanist Bill Theobald will be one of a handful of people to thank for it. The hurricane demolished his South Dade nursery. He rebuilt it, then watched

in helpless anger while beetles consumed the five-acre stand of pines outside his door. Now, the Dade County pines' last chances for survival are piled on Mr. Theobald's office floor: 22 burlap bags full of pine cones, carefully labeled with the names and locations of the forests where they were collected.

A five-man crew of state and county foresters painstakingly gathers the cones by hand, hoping to preserve not only the pinelands, but the biological secrets they contain. Around the August 24th anniversary of Hurricane Andrew, the trees in the southernmost stands began shedding their cones. Only days later the cones would open and the seeds would scatter.

The foresters raced to collect the cones before they opened, working six days a week amid the heat and mosquitoes of late summer. Because the delicacy and rarity of the understory plants made it impossible to harvest mechanically in the deep woods, they scouted each stand on foot, looking for the few trees still living.

The collected pine cones will be sent to a state experimental nursery in Chie-

land, Florida, where they will be dehumidified on wire racks, then shaken to sift out the seeds. Kept dry and cool, the seeds can be stored for up to five years. Next fall, workers at the Chiefland nursery will sow the seeds in germination beds. By June 1995, the eight- to 12-inch seedlings should be ready for hand planting. Workers will use mattocks to gouge planting holes in the rock-riddled soil atop the limestone ridges.

"This isn't experimental technology," says Mr. Theobald. "These are methods that have been used in commercial forestry for years." But never before have they been put to such a purpose: the re-creation of a dying, remnant ecosystem in all its natural diversity.

It may take a generation, the botanists say, before the tall slash pines crown South Dade's horizons again. In the meantime the sunbleached, barebranched trees stand lifeless along mile after mile of suburban roadsides.

Heather Dewar is the environment reporter for the Miami Herald. Adapted with permission from the Miami Herald.

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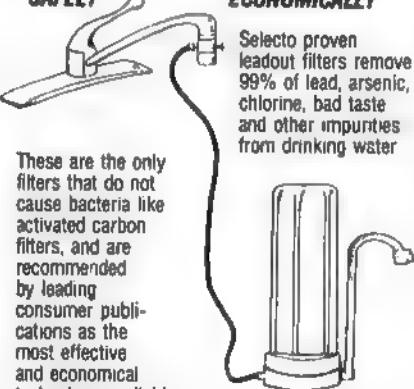
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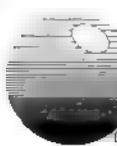


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**While old lead paint is the
biggest contributor to lead
poisoning, new studies
suggest an equally ominous
source: lead in drinking
water. The good news is most
homes do not have abundant
lead molecules flowing
through the tap. If yours
does, there are a number of
steps you can take for...**

All over the country people stopped, coffee halfway to lips, to read the morning's headlines: "Lead in Ourtown Water!" This past May, when the EPA released the first comprehensive tests of municipal water supplies, at first blush it seemed a lot of cities were feeding their citizens tap water laced with toxic lead. The study found that lead in drinking water exceeds federally permissible levels in almost one-fifth of the nation's largest cities.

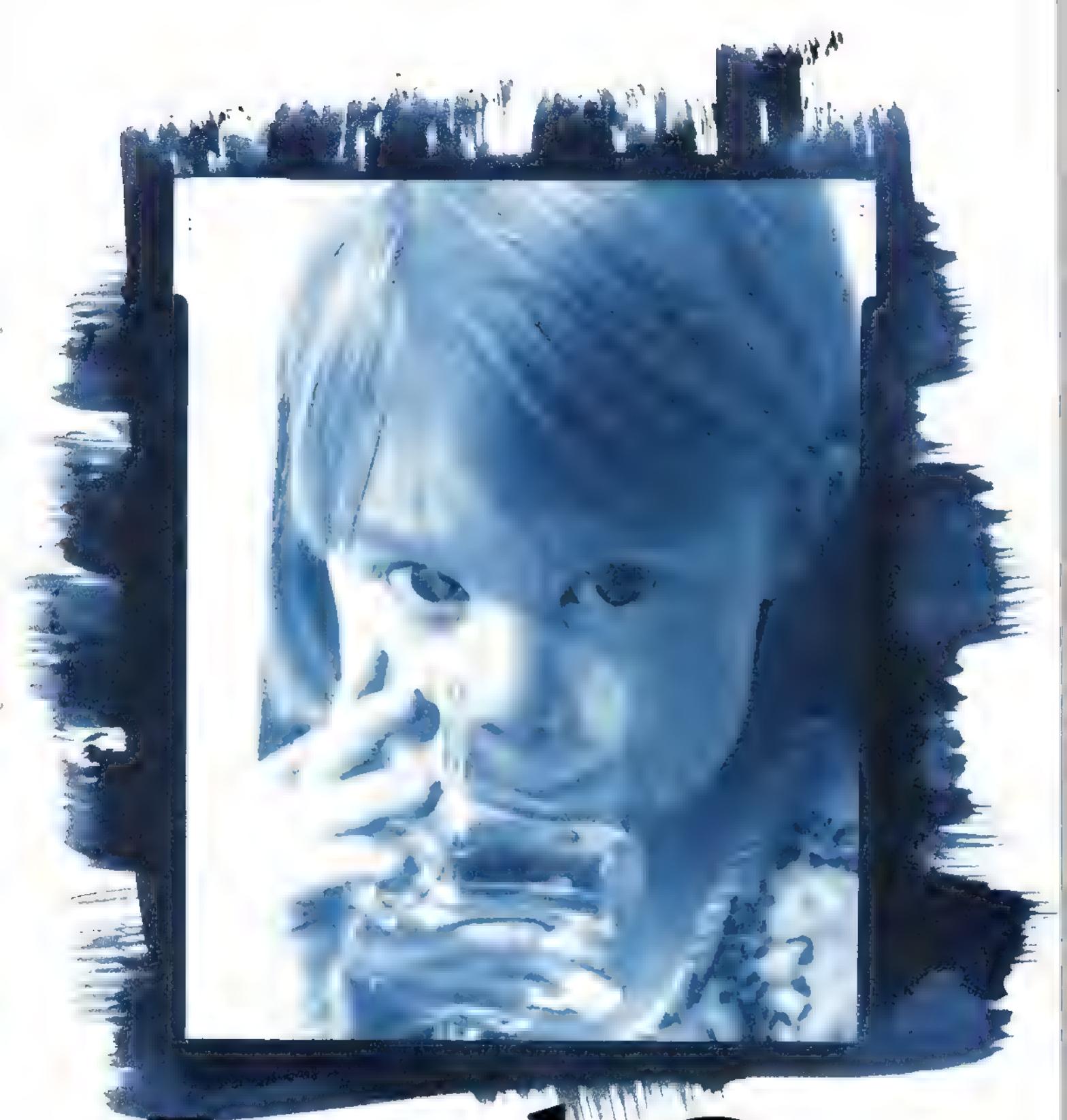
While lead is not a metal to mess with — even at relatively low doses it causes irreversible damage to children's intelligence, among other things — not every citizen of every town on "The List" is drinking dangerous water. And by the same token, the water in towns that escaped The List is by no means lead-free. The List was just a roster of 816 public water systems where the EPA drinking water survey discovered too much lead coming out of the faucets in some "high-risk" houses with lead service lines or with interior lead pipes and soldering.

Because the water tests were directed at high-risk homes, they do not represent average lead concentrations in home water for those communities. However, according to the newsletter *Child Health Alert* the high levels were not worst-case situations, which occur when water is left standing in the pipes for one to three days.

The tests (indirectly) tell us that most people who have soft, acidic water should have their water tested for lead and that some people, including all infants, should have their blood tested, too. At high exposures lead is a serious health hazard, and mounting evidence has established that it's a significant hazard at ever lower exposures.

Lead in drinking water comes from plumbing of a certain age or type of city water line, or even certain properties of the water itself. (The softer and more acidic the water, the more corrosion in the pipes and the more lead in the water.) Most homes do not have high lead-levels in drinking water. But when it does crop up, leaded water is often a very private sort of problem, which is both bad and good. True, the lead in your water may be leaching from inside your own plumbing. But at least there are abundant solutions you can institute right now, without waiting for a govern-

Getting th



eLeadOut

ment program to come clean it up.

THE SILENT SYMPTOMS

WHEN ASSESSING THE HEALTH RISKS OF LEAD, WE SHOULD FIRST consider this footnote: It's not a theory — the risks of lead exposure are not drawn from models or calculations.

According to the federal Dept. of Health and Human Services, "lead-risks are well known from studies of children and are not extrapolated from data on lab animals or high-dose occupational exposures." Don't trust the



WHEN ASSESSING THE HEALTH RISKS OF LEAD, WE SHOULD NOT FOLLOW A THEORY — THE RISKS OF LEAD EXPOSURE ARE DRAWN FROM STUDIES OF CHILDREN

government? In a review of the epidemiology of childhood lead poisoning over the past 40 years, published in the Spring '93 issue of *The Milbank Quarterly*, author Barbara Berney reports that by the late 1980s toxicologists had established a clear dose-response relationship linking lead and neurobehavioral problems.

"Although the neurobehavioral effects of lead, as measured by standard development and IQ tests, may not always be the same, its biochemical effects were well documented and specific," writes Ms. Berney. "Extremely high exposures to lead cause encephalopathy and death, lower doses cause severe retardation, and lesser doses lead to school problems and small but significant shifts in IQ."

In recent years, many lead-targeted epidemiologic studies have focused on low-level exposures, according to Dr. Herbert Needleman, who's been studying the neurobehavioral effects of lead for the past 20 years and has a clinic at the University of Pittsburgh. Commenting in the *American Journal of Public Health*, Dr. Needleman reports that almost all of the stud-

ies "conclude that lead is associated with disturbances in cognition, behavior, and attention at levels below those that cause frank symptoms."

Lead is a heavy metal with no known physiological value in humans. How does lead affect human health? Reports drawn from the *Harvard Health Letter*, *Medical Update Quarterly*, and *American Family Physician* provide a summary.

Lead is an element that cannot be broken down into something else. Kidneys and organs cannot excrete lead, and it tends to remain once ingested or inhaled. Almost any body tissue can absorb it, although 90 percent of it ends up in our bones. Unfortunately, not much information exists yet about the potential

hazards of lead that comes from bone.

Lead acts primarily by disturbing enzyme systems, such as the one involved in the formation of hemoglobin (the molecule that transports oxygen through the bloodstream to organs and tissues). When extremely large amounts of lead are present in the blood — over 80 micrograms lead per deciliter of blood (g/dL) in adults and over 40 g/dL in children — practically every part of the body pays a price, especially the nervous system and kidneys.

Lead is particularly toxic to children for the following reasons: incomplete development of the blood-brain barrier before age three allows lead to more readily enter the central nervous system; ingested lead has 40 percent "bioavailability" (the portion of the ingested dose that's absorbed by the intestines) in children compared with 10 percent bioavailability in adults; frequent hand-to-mouth activity greatly increase the risk of childhood ingestion.

It's impossible to discuss the sources of lead without talking about old lead paint, which is the biggest contributor to lead poisoning. Children also pick up lead from contaminated

Testing the Waters

Water-testing labs are certified by the states, which follow standards dictated by the EPA.

The "first-draw" sample is most common, but not sufficient. It's taken from the cold tap after the water has been soaking in the pipes for at least 6 hours. It's usually the worst-case scenario. EPA recommends a one-liter sample. If the lab asks for a cup, take a one-liter sample, shake it, and pour off a cup.

A "flushed-line" sample is taken after running the water for a minute or two. This is supposed to demonstrate that you can get safe water from your tap. Flushed readings may be higher than the first draw, especially if your city's service lines are lead. Have both done. Because of discrepant readings like Hannah's (20 ppb from one lab, 37 from another — see p. 30), consider testing twice — temperature, water acidity, and other important factors change daily.

If your reading is more than 15 ppb, you're in the action range. See "Purging Lead," in the main story, for steps to take.

As for finding a lab, many water districts are testing for free these days. If they say no, ask for a list of nearby certified labs. In the mail-away department, Consumers Union recommends the following labs. Prices are for two samples, a first-draw and a flushed-line:

Suburban Water Testing Labs, Temple, Penn.: (800) 433-6595, \$35. National Testing Laboratories, Cleveland, Ohio: (800) 458-3330, \$35. Clean Water Fund, Asheville, N.C.: (704) 251-0518, \$17.

soil, and from the clothing of parents who work with lead. And about 20 percent of the lead kids may collect comes out of the faucet. Cases aren't commonly attributed to water alone, although formula-drinking infants in high-lead cities constitute a serious exception since the child drinks 32-40 ounces of water daily. Water is more often an accomplice than a sole villain. Whatever the sources of lead, the results are the same.

With a growing body of evidence showing that even small amounts of lead erode IQ and cause behavioral disturbances, the Centers for Disease Control lowered the definition for lead toxicity to 10 g/dL in 1978 and then to 25 g/dL in 1985. After another review of the latest data, in 1991 the CDC

ULD FIRST CONSIDER THAT IT'S NOT AWN FROM STUDIES OF CHILDREN.

concluded that lead toxicity is found at levels of 10 g/dL — one-fourth the level of 20 years ago. (The CDC do not actually know if levels below 10 g/dL are without effect or even safe.)

"The new definition puts an extraordinary number of children at neurotoxic risk," writes Dr. Needleman in the *American Journal of Public Health*. "Data indicate that 17 percent of all children, regardless of race or socioeconomic status, have blood lead levels in the toxic range."

What is lead's neurotoxic effect? The CDC believes that any child with 10 g/dL at age two can expect a deficit of four to six IQ points when IQ stabilizes at age 10. Add to that the EPA's conservative rule of thumb: For every 10 parts per billion of lead in the water, a child's blood lead will rise by 1 or 2 g/dL over the course of a year. A two-year-old would have to drink water with 50 ppb lead to accrue a blood-lead level of 5 to 10 g/dL, and lose two to six IQ points. Water with 50 ppb lead is not common, but it exists, especially in lead-heavy cities like Boston and Chicago. (The EPA review of municipal water supplies found ten communities with lead-levels at more than 70 ppb.) Often, it's water's cumulative effect with other sources that should be a concern.

The prognosis for lead-poisoned children is widely variable, because of individual tolerances, age, diet, family, and medical care. But the majority of cases lie in the IQ-damage range of four to 15 points (IQ between 85 and 115 is normal). Currently, these deficits appear to be permanent, but doctors generally believe that a motivated child can compensate for some attention-deficit disorder and lost IQ.

The bottom line here is that, as the CDC says, "Virtually all children are at risk for lead poisoning."

Given the reduced upper limit for safe lead concentrations, combined with evidence of significant dispersion of lead in the environment, many experts conclude that lead poisoning is the health problem that affects the largest number of American children. Those whose homes are known to house lead should be screened first at six months; all children should be screened by one year of age. A blood-lead level of 10 g/dL or more should trigger parental detective work to discover if

Home Filter Options

Consumers Union is the undisputed authority on water filters, which it rates in the February 1993 *Consumer Reports*.

Lacking guidance from EPA on who should use a filter, CU took it on itself to set some standards. They generally advocate that anyone who is vulnerable (pregnant women, children under six, and anyone with high blood lead), and whose water shows any lead, should use a filter — the more lead, the better the filter. Even for people not at risk, they recommend a filter if the first-draw sample shows more than 15 ppb lead, or the flushed-line, 5 ppb.

There is no one perfect filter for removing lead. All of them have drawbacks, yet the majority do a good job in homes where lead contamination is not extreme. When shopping for a filter, consider the severity of lead contamination in your drinking water and the amount of water you consume, in addition to price and efficacy. The best filters, distillers and reverse-osmosis models, remove an impressive 99 percent of lead.

CU calls distillers a "good choice if you need highly effective lead removal." Distillers evaporate water, then condense it in a separate container, leaving impurities behind. They use electricity and generally take several hours to purify a gallon of water. CU likes the Sears Kenmore Distiller #3450, at \$100.

Reverse osmosis filters force water against a membrane that rejects large molecules. They are best for homes needing "maximum lead removal," says CU. They waste as much as 30 gallons of water a day and they're somewhat pricey: CU's two picks are Culligan Aquaclear System H-83 (\$750), and the Sears Kenmore 3490 (\$399).

Comparably less-effective models — and they still get between 81 and 99 percent of the lead out — depend on trade-secret filters. Among the configurations are:

Undersink: Drill a hole in your sink, and add a little faucet fed by the filter. Less pricey than reverse osmosis units, undersink filters are best for households which consume a lot of water. CU liked the Selecto Lead-Out 20, at \$85; the MultiPure MPC500B, at \$330, looks good, too.

Countertop: A tube connects your faucet to the cylindrical filter, which has its own faucet. They take up counter space but do not require major plumbing changes. CU found the Ametek CT CMR-10, at \$65, to be cheap and fairly fast.

Faucet-mounted and carafe-style filters are generally effective and less expensive than other solutions, although CU found performance problems or extravagant maintenance costs with some models.

Outside of CU's recommendations, look for a lead-removal claim, along with a NSF seal, which means the unit has passed rigorous testing. For a list of certified units, write National Sanitation Foundation, drinking water treatment units, P.O. Box 130140, Ann Arbor, MI, 48113-0140.

the lead is coming from paint, soil, dust, ceramic glaze, water, or even school or day-care sources.

FACING THE FAUCET

HANNAH HAD HER WATER TESTED TWICE, AND GOT DIFFERENT instructions from each tester. The Portland Water District wanted one liter in their own plastic bottle; Maine Environmental Laboratories wanted one cup, in any plastic container. Maine Environmental said to put the sample on ice until she could deliver it, while PWD made no mention of temperature. The PWD test was free; the commercial lab charged \$24.

Hannah's is not a risky house, or so she thought. Though it's old, the original plumbing is long gone, replaced by copper. The city lines are not lead. But between the reservoir and the tap, there are numerous places where lead can seep in. (See diagram, at right.)

The water mains that run under city streets are generally cast iron. It's the service line — the pipe that runs between the main and your house plumbing — that presents the first big problem. In cities over 100 years old, it is likely to be lead.

Next are the home's own pipes. Lead plumbing was used through the 1920s. But most of these houses have been replumbed by now. (Lead pipe is a dull gray color and can be scratched with a file — if the exposed metal is shiny, you've got lead. New copper is about the same color as a new penny.)

Copper pipes don't mean you're home free. Lead solder wasn't banned until 1988, so any home plumbed before then probably has it. Even after that, many plumbers used it — it was legal for other uses, and it worked better than the early lead-free solders.

Not done yet — even a faucet that's marketed as "lead free" is permitted to contain up to 8 percent lead.



and they may be responsible for as many high readings as solder. Virtually all metal faucets have brass/lead valves, but in a matter of months, their leaching theoretically ceases. Any one of these sources can loft lead readings well into the danger zone.

So, while public officials target their concern on "high risk houses," with a lead service main or fresh solder (10 years old or less), it's abundantly clear that any house with any source of lead is at some risk.

Yikes! A few days after Hannah took her water samples, PWD reported that she had been drinking water with 37 parts per billion (ppb) lead. The action level is 15 ppb.

All of this testing business started in May of 1991, when the federal EPA ordered public water suppliers to monitor the tap water in hundreds of thousands of "high risk" homes. The

point was to detect systems where 10 percent of the houses showed more than 15 ppb lead. When Consumers Union conducted its own round of national testing, published in the February 1993 *Consumer Reports*, it seemed to show that EPA had indeed found the high-risk houses. Readers who sent in water samples being a more general sample, only 4 percent of their "worst-conditions" samples measured above 15 ppb. The nation as a whole, *Consumer Reports* reports, isn't suffering from widespread, high-level lead.

The single, solitary way to know if you're drinking dangerous levels of lead is to have your water tested. Twice. Shortly after PWD phoned with Hannah's 37 ppb diagnosis, Maine Environmental called to say the reading was 20 ppb. Hmmm. The discrepancy could be blamed on different temperatures (warmer water will leach more lead), or how hard the faucet was turned (rushing water will dislodge more lead), or even on something called politely "sampler error" (collecting the water in a dirty jam jar). Had she just received the 20 ppb result, she'd be less rigorous about her new regime — not a comforting realization. (See Testing the Waters, p. 28)

PURGING LEAD

THE FIRST STEP IN GETTING THE LEAD OUT IS FINDING WHERE IT'S getting in.

In Hannah's case, her service line is galvanized steel, according to PWD. She calls the National Sanitation Foundation [(313) 769-8010] to locate Delta, which made her sink faucet. Delta says the chrome faucet houses a brass valve which contains lead. It's also likely that a sloppy lead-solder job is donating its molecules to the morning coffee. So she calls the EPA's Safe Drinking Water Hotline — (800) 426-4791.

"You might ask a plumber to change your plumbing," she's told. She's also advised to get the *Consumer Reports* story from the library, and think about buying a filter system. Final-

AVING A PLUMBER CHANGE THE HOME'S PLUMBING IS COST OF TEARING DOWN THE WALLS AND RESOLDER

ly, she's given the simple answer: Flush the line before drinking, and never, never, never cook with hot water. To repeat:

- For drinking purposes, fill a pitcher when you finish a chore that flushes the cold-water line — flush as long as it takes for the water to run cold, 30 seconds to two minutes. Keep it in the fridge. Keep out another pitcher for cooking, etc.
- Never, never, never cook with hot water. It leaches much more lead from the pipes.
- Don't boil water longer than necessary, as this will concentrate any lead in the water.
- Use bottled water to make baby formula.

The next practical steps are...

- Hannah is considering a plastic faucet. This eliminates brass/lead valves. Nibco makes \$40 to \$70 PVC-free plastic faucets (chrome plated) that are lifetime-warranted. (800) 642-5463.

- After that, she'll get her water tested again, and consider buying a filter. (See Home Filter Options, p. 29.)
- Having a plumber change her home's plumbing, however, is out of the question. If there was one section of lead pipe — perhaps. But the cost of tearing down the walls and resoldering every joint is off the map.

The final strategy is...

- Wait. EPA is requiring all public water systems to come up with a lead solution by 1997. One option is to "balance" the water. It is soft, acidic water that chews lead out of pipes. Adding basic agents (lime, baking soda), reduces the acidity. But often, this isn't enough.

Another response is to artificially harden the water, adding compounds like orthophosphate or silicates that will coat the pipes, entombing the lead. (Phosphates, long implicated in causing algae blooms in lakes, however, have proven their adaptability by causing them in Boston's water mains.) While none of these additives presents a health threat, they may require the construction of new facilities at the treatment plant. This would be especially expensive for small systems with few customers to share the burden.

A final option is to exhume and replace lead service lines with copper or PVC plastic. The City of Denver just did this at an expense of about \$432 per house.

Copper isn't a miracle cure, though. Copper corrosion presents a health problem in its own right. But it's much easier to beat than lead — the drinking water survey found copper to be under control. And PVC? "In a few years, we'll probably find out there's bad stuff coming out of plastic pipe," chuckles George Craft, resources engineer for the American Water Works Association. "That's pure conjecture — we're going to find that everything has bad stuff coming out of it. But who wants to live to be 500 years old anyway?"

Thanks, George.

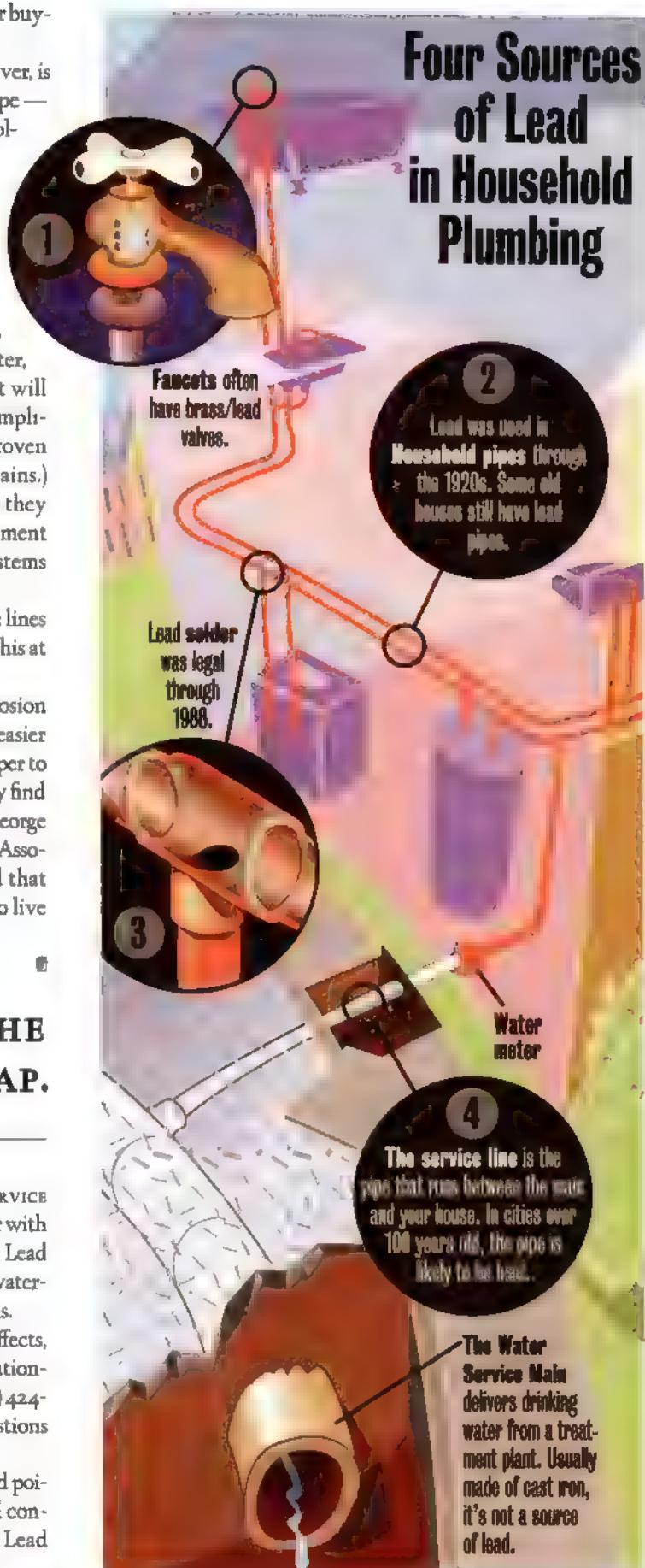
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FOR MORE INFO

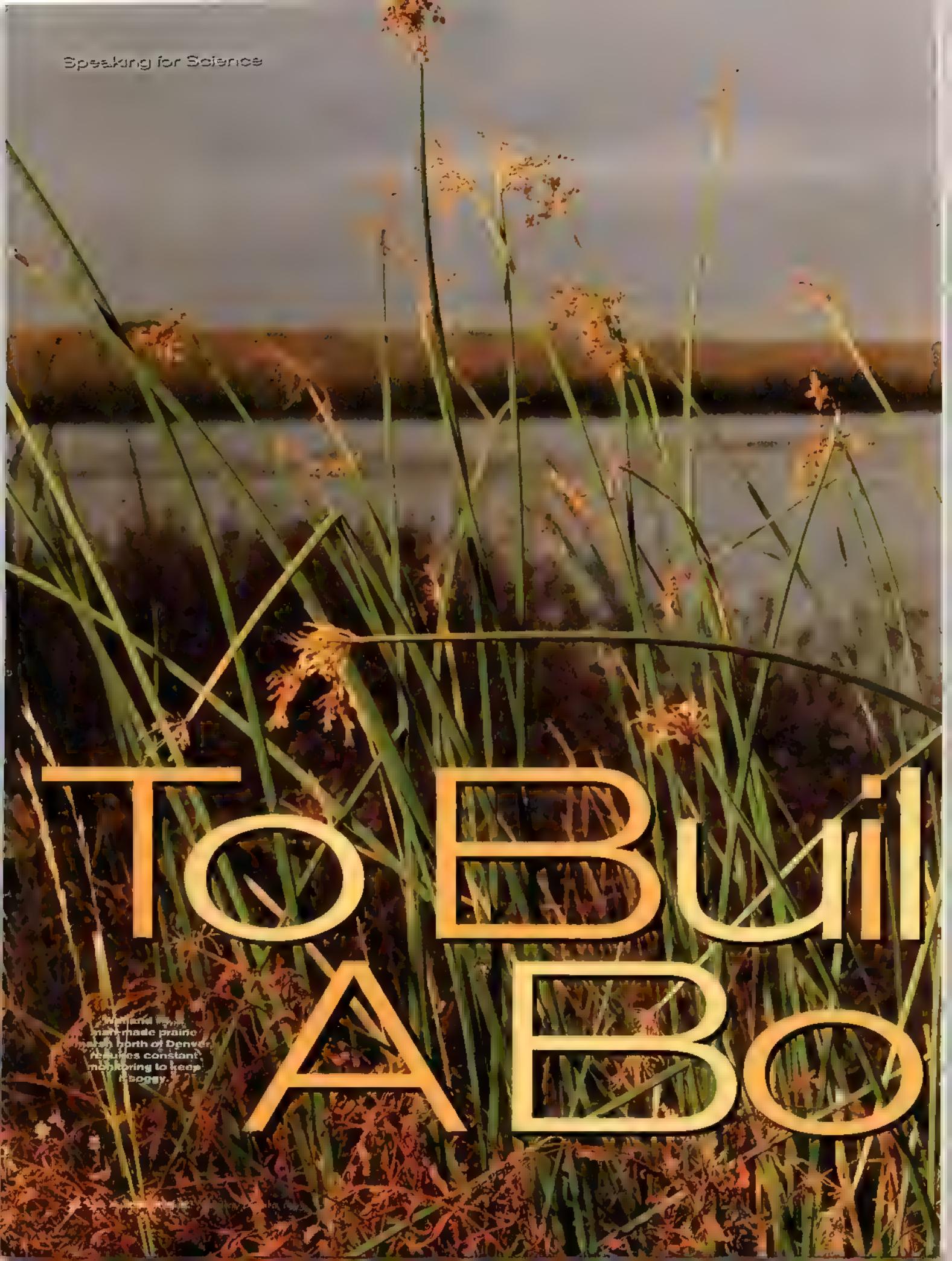
YOU CAN TEST YOUR HOUSE FOR LEAD PAINT BY USING A SERVICE that may be available from your local health department or with an kit that you can obtain for \$49.95 ppd. by calling the Lead Institute at (800) 532-3837. The Institute also supplies a water-testing kit for \$39.95 ppd. Both prices include lab analysis.

If you've got questions about lead sources, health effects, or other matters, you can call the federal government's National Lead Information Center clearinghouse toll-free at (800) 424-5323. Specialists are on hand to answer lead-related questions Monday through Friday, 8:30 am to 5:00 pm EST.

For a brochure on how to protect children from lead poisoning, fact sheets on testing, and a list of state and local contacts who can provide more details, dial the National Lead Information Center's toll-free hotline at (800) 532-3394.



Speaking for Science



TOBACCO

man-made prairie
in north of Denver,
requires constant
monitoring to keep
it healthy.



In theory, scientists can construct new wetlands to replace those that are buried and blacktopped. In practice, it's not so simple.

Drive the northern reaches of the New Jersey Turnpike, and you'll be greeted by wet-wood-clad marshlands backed by the great gas tanks and refinery towers which crowd the lower Hudson River. There are the Hackensack Meadowlands. Braised by a century of mining and road building, mosquito eradication, and garbage dumping, it might seem that the only thing that could nest in the once-fertile mudflats are discarded tires.

As a kid growing up in New Jersey, the Meadowlands had a seductiveness, a dark beauty that is now hard for me to fathom. Perhaps I was entranced by rumors that newly defunct members of the ring-on-the-pinky-finger set were buried in the Meadowlands. Or maybe it was the local legend that "bog-trotter" kids lost in the Meadowlands' upper meadows, fishing the taky creeks and trapping muskrat. But I suspect the place's real allure was that, despite the smokestacks and garbage dumps poking the horizon, the Meadowlands seemed like the only wild area left in that part of Jersey.

Driving along the Turnpike, from the back seat of my folks' Chevy station wagon I'd see hawks circling high over the cattails, searching for rabbits and mice; and ducks plying choppy that meandered around small hillocks, tufted with marsh grass. I was enchanted by its wildness and mystery. Sure, the place was "swamp." That's precisely why no developer had bothered with it yet.

Although wildlife still abounds, vast swaths of the Hackensack Meadowlands have suffered a fate similar to much of the nation's swamps, bogs, and marshlands: they've been ditched,

By Bill Breen

PHOTOGRAPH BY
Stephen Colleter
& William Huber

Despite past successes, Martin Michener calls the wetlands-creation process a "crap shoot."



drained, filled, and blacktopped. Twenty-five years ago, the only "development" in the Meadowlands was the Rte. 3 Drive-In. The drive-in is gone, replaced by office complexes and megaplexes and condominiums, malls and marinas and parking lots and that Brobdingnagian edifice to pro football, Giants Stadium.

And yet the marshland's mystery still holds, there on the outskirts of a Meadowlands mall. Walk far enough and you hit it — land that's dank and paludal, suburban wild land that's throbbing, perhaps, with the last-ditch hold-outs of animal life.

Not Made by Nature

BLACK, BUTTERY MUCK SEEMS TO MELT AND open underfoot as Martin Michener leads me from a stand of white pines and out onto the bank of a sinuous marsh just south of Portsmouth, New Hampshire.

"Does this look like a wetland to you?" Dr. Michener asks.

It certainly does. Clumps of soft rush (*Juncus effusus*), a premier marsh plant, march out into the water, followed by the ranks of common emergents such as

bulrush (*Scirpus validus*) and spikerush (*Eleocharis* sp.) and several species of sedges (*Carex* sp.). In the shallows the violet-blue, spiky flowers of pickerelweed (*Pontederia cordata*) poke through the surface. Mats of pondweeds (*Potamogeton* sp.) float in deeper water, caressing the edges of a beaver lodge.

I've read that wetlands are critical breeding grounds for fish, birds, and other creatures, but I'm unprepared for what I see here: approaching the marsh, we scare up a flock of blue-winged teal; deer and opossum tracks and muskrat trails snake through patches of native cranberry (*Vaccinium macrocarpon*); a black-crowned night-heron and a green-backed heron prowl the sedges; perched on a high pine's spire, a red-shouldered hawk surveys the scene.

And yet, this is no marsh made by nature. Seven years ago it was literally created from a played-out gravel pit scarred by ATVs and fly-by-night construction companies which used it as a dumpster.

The marsh was built to compensate (or "mitigate," according to engineering types) for another marsh that was buried

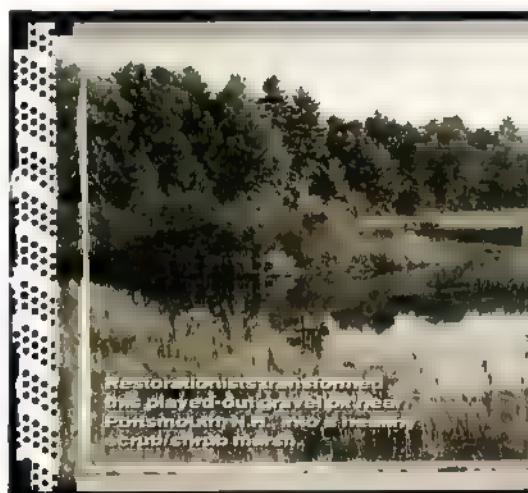
under a new Portsmouth hospital. With Dr. Michener directing, a backhoe carved out a series of pits which extend below the water table, creating pools. A top dressing of muck from the hospital wetland was trucked in and spread over the newly created swales. The boggy soil, which was chock full of plant seeds, served as a seed bank for the emerging marshland. Later, beavers plugged up a small outflow channel, raising the water level by about two feet and creating a scrub/shrub swamp in the marsh's northern corner.

Is this man-made marsh a success?

Dr. Michener, a veteran wetlands ecologist with the restoration firm Normandeau Associates Inc., stifles a laugh. "What do you mean by success?" he asks rhetorically. "We took an upland series of hillocks that was very degraded and made a wetland out of it — one that seems well-integrated with a nearby [natural] red-maple swamp."

"Then again," he continues, "you can't rely on engineering protocol to re-create the complex interplay between water, flora, and fauna that you'd find in a pristine wetland."

As the nation steadily loses marshes, swamps, and bogs at a rate of something like 290,000 acres a year, biologists and engineers are pioneering techniques to heal scarred wetlands and even create new ones. It's a tricky, exacting discipline that sometimes depends on a hunch to succeed. Though Dr. Michener and a handful of others have been in the business long enough to learn from mistakes and build up an expertise, he calls the



wetlands-creation process a "crap shoot."

But as state governments belatedly require, say, a road builder to do penance for a marsh that he's blacktopped by creating a new marsh, practitioners who lack a scientific grounding in wetlands ecology are rushing into the field. More often than not, according to study after study, their "wetlands" quickly degenerate into dry lands or deep ponds.

"The problem is we've got a lot of cowboys running around who have no business even being near a bog," says Dr. Michener. "They'll do something like dump a lot of fertilizer into a [new] bog to green the sucker up, and for a while everything looks okay. But a year later you get invasions of purple loosestrife which crowd out native bog plants and ultimately offer pretty poor habitat."

By then, he adds, the inexpert restorationist has gone on to the next project. And the bog is doomed.

Of Plows and Potholes

WHILE IT'S TEMPTING TO BLAME SHOPPING malls and storefront condos for getting rid of wetlands, history shows that farmlands have been far more destructive. According to the General Accounting Office, Congress' investigative arm, over 80 percent of past wetlands losses are due to drainage and clearing of inland wetlands for farming. Iowa has already lost an estimated 99 percent of its marshes to agricultural drainage; while almost 60 percent of the Dakotas' original prairie potholes — one of the continents' most significant breeding grounds for

"Wetlands" is All Wet: Try Swamps, Bogs, and Fens

THE PRECISE MEANING OF THE TERM "WETLANDS" is as vague and hazy as the not-always-wet, but not quite-dry lands it purportedly describes. The mucky truth, say some scientists, is that the unlimited variety of hydrology, soil, and vegetational types found in wetlands cannot be subsumed by one definition, no matter how much moisture the term enfolds. While "wetlands" may sound more scientific and less pejorative than, say, "swamp," it's simply a squishy catch-all for lands that are transitional between aquatic and terrestrial environments.

Here are some of the major, freshwater wetland types:

Bog — Derived from the Gaelic word for "soft," its peat-rich ground is moistened entirely by precipitation. Bogs often develop in glacial lakes, where peat accumulates as plant material gradually decomposes. Sometimes, so much peat builds up that it forms a dome in the bog's center. In southeastern states, such a raised bog is called a "pocosin": Algonquin for "swamp on a hill."

Fen — Is also a peatland, but it is fed by precipitation and groundwater. When the water comes in contact with mineral soils and feeds the peatland with nutrients, it produces a broader range of vegetation than the mineral-poor soils found in true bogs. Fenway Park in Boston, home of the Red Sox, rises up out of a vast peatland — "the Fens" — that was filled during urban development.

Marsh — Characterized by soft-stemmed herbaceous plants called emergents, which grow with their stems partly in and partly out of water in sloughs, river floodplains, and other wetland types. Marshland vegetation includes an herb of the mallow family once used in preparing a confection called "marsh-mallow." In Europe, the synonym for marsh is "mire," from the Old Norse.

Prairie Pothole — Retreating glaciers scoured depressions that gradually filled in with decomposed vegetation, forming marshes that pockmark the grasslands in Minnesota and the Dakotas. "Playas" (Spanish for "beach"), another type of prairie marsh, are scattered across the Texas panhandle and eastern New Mexico. Local legend has it that playas originated as buffalo wallows, although scientific evidence suggests winds carved out depressions that filled with rainwater.

Swamp — Land that's permanently or periodically saturated by standing water and dominated by trees and shrubs. Swamp soils are highly organic, commonly forming a black muck — William Safire suggests that "swamp" may share a root with the Greek *somphos*, or "spongy."

Aside from swamps, bogs, and the like, wetlands spill over to sub-types including "carrs" (shrub-covered peatlands), "strangmoors" (sub-Arctic, patterned bogs), "eccentric bogs" (bogs which slope in one direction and occur on the sides of valleys), and lands that the Army Corps of Engineers concludes are "not easily recognized" as wetlands.

What's the opposite of "wetlands"? If you guessed "drylands," guess again. According to the EPA, it's "uplands."

Sources: Wetlands (Alfred A. Knopf, Inc.); Bogs of the Northeast (University Press of New England); U.S. Dept. of the Interior; BioScience; Maine Agricultural Experiment Station, University of Maine; New York Times Magazine, "On Language."



migratory birds — has been converted to cropland.

Farmers were not creeping around under a full moon to cut drainage ditches. They were doing exactly what the federal government encouraged them to do. From 1849 to 1860, a series of Swamp Land Acts gave 65 million acres of wetlands owned by the feds to 15 states for conversion to agricultural dry land. As late as 1953, the federal Department of Agriculture announced that 50 million acres of swamp lands "would be physically suitable for crop and pasture use" if they were ditched and drained.

Now, of course, we know better. More than half of all threatened or endangered species depend on wetlands during their life cycle. Even a small fen can act as a natural filtration system, absorbing and volatilizing some of the excess nitrogen and phosphorous (found in fertilizers) from agricultural runoff.

Then again, we needn't always think of wetlands in terms of what they can do for us. They also have much to teach.

Charles Johnson, in *Bogs of the Northeast* (University Press of New England), writes that the "deep pages" of a peatland are a living library of ecological and human history: In the Northeast, pollen preserved in peaty strata indicate that the initial growth that followed the glaciers' retreat 10,000 years ago was tundralike, stunted spruce-fir vegetation; plantain (*Plantago* sp.) and ragweed (*Ambrosia* sp.) pollen mark the advent of colonial clearcutting and agriculture; mastodon and mammoth bones preserved in a peatland's wet, seemingly bottomless center demonstrate that these extinct giants roamed the Northeast during the Ice Age; ddt, rcb, radioactive fallout, and other products of our industrial age are trapped in the upper layers — dramatic increases of lead deposits herald the auto's advent.

"We have realized that bogs are incredible bits of the world, valuable both for what is living at the surface and for what is stored below in the peats," writes Dr. Johnson. "We are beginning to appreciate them simply for what they are: discrete ecosystems unlike any others."



If a little water is good for a wetland, is a lot even better? Ecologists David Cooper (foreground) and Don D'Amico think not.

So Much Depends on Water

WETNESS — IN THE FORM OF SATURATED soils or long periods of flooding — is the special condition necessary for swamps, bogs, and marshes to evolve. Naturalists like Charles Johnson tell us that water, whether from atmospheric or ground-water sources, must be abundant throughout the season's cycles. The source of water, the nutrients it carries, the timing of wetting and drying, and the overall temperature regime strongly influence the kind of wetland that develops — whether it's bog, fen, marsh, swamp, or some combination.

Scientists attempting to characterize wetland types focus on attributes like hydric soils, which develop under the influence of water; water-dependent plants called hydrophytic vegetation; and hydrology, the presence and behavior of water. Hydrology is at the heart of wetlands creation — it's the water's depth and flow and seasonal variations that make the wetland what it is. If the water is too deep or too shallow or is not there at the right time of year, vegetation that's

uniquely adapted to soggy soil will die and the project will fail.

A favorite tactic of Martin Michener's for sleuthing a marsh's hydrology is to visit the place during a heavy downpour. In the pounding rain, he looks for water trickling through small channels and rivulets from lowlands into the marsh. Then he tries to trace how the water moves — where it comes from and where it goes.

"Each wetland is a mystery because the hydrology is invisible," says Dr. Michener. "For the project to succeed, you've got to unravel the mystery."

Studies of wetlands-creation projects by EPA consultants and academics in Connecticut, Massachusetts, and New Hampshire conclude on a common note: failure due to improper water levels and otherwise flawed hydrology is widespread. Many of the sites were dominated by deep, open water rather than the shallower water necessary for supporting hydrophytic vegetation. Often, the bulldozers were creating ponds instead of wetlands.

Part of the problem in determining whether a project succeeds depends on

how you define "success." In their introduction to *Wetland Creation and Restoration* (Island Press), editors Jon Kusler and Mary Kentula argue that building a wetland which totally duplicates a naturally occurring bog is impossible: it takes thousands of years for plant matter to decompose and evolve into a mature peatland; besides, the science isn't up to replicating the subtle relationships of hydrology, soils, vegetation, animal life, and nutrients found in a natural bog.

Practitioners have fared fairly well at creating freshwater marshes. In a marsh, feeder streams and outflows are more apparent, and water levels are therefore easier to predict. The Kusler-Kentula report also notes that native seed stocks are often laced throughout marsh-soil, allowing emergent plants to revegetate.

Water fluctuations are much subtler and harder to detect in a forested wetland. And in bogs, which may depend completely on rainwater recharging underground water, the water's movement can be almost impossible to hunt down. To add to the difficulty, it takes at least 40 years for trees to mature. Only

then can a scientist determine whether a forested wetland is truly succeeding.

The problem is that monitoring of a wetland-creation project typically lasts for just a year or two, if at all. And looking good for two growing seasons, some experts contend, is not good enough.

"It's not enough time to make a real sound judgement," says Dr. Michener. "Our impatience accounts for a lot of the failures."

Wetland #4

WETLANDS CREATION BECOMES A BIT MORE doable when success is defined as fulfilling a few limited but essential objectives, such as providing critical wildlife habitat or clean-water filtration. These are the long-term goals of five experimental wetlands born in a most unlikely place: Colorado's Rocky Mountain Arsenal, a haz waste dumpsite turned National Wildlife Area.

Just 10 miles north of downtown Denver, the Arsenal unfolds across 27-square miles of high-plains prairie. Beginning in 1942, the Army manufactured mustard and nerve gas and incendiary cluster bombs here; later, Shell Chemical

Co. moved in and produced DDT, dieldrin, chlordane, and other hazardous chemicals. Wastes were dumped in natural depressions, which inexorably leaked toxic soups into the groundwater. Now, the Arsenal is a top priority Superfund site.

Even so, the splotches of toxics are concentrated in small areas. And as Denver's sprawl claimed prime habitat, wildlife found a haven among the Arsenal's shortgrass meadows and cottonwood groves. Jouncing along the prosaically named Ninth Ave. in Don D'Amico's pickup, we spot ferruginous hawks and Swainson's hawks, northern harriers and great-blue herons and fat mule deer, their antlers sheathed in velvet.

Mr. D'Amico, a graduate student in wetlands ecology at Colorado State University, steers the pickup over the crown of a hill which slopes gently downward into a small basin, hollowed over many millennia by high winds storming out of the Front Range.

Fed by water from an irrigation ditch, the basin is fringed with cattail (*Typha latifolia*), softstem bulrush (*Schoenoplectus lacustris*), smartweed (*Persicaria* sp.), and other common wetland plants. This is a prairie marsh, created by biologists from Colorado State University and the U.S. Fish and Wildlife Service. They call it "wetland #4."

Of the five man-made marshes, #4 is the most heavily vegetated. In summer, Mr. D'Amico puts in 50-hour weeks to make it so. Last year he weeded two-to-three cattail per square foot over several acres of the four-acre marsh — otherwise, the opportunistic plants would have quickly spread and crowded out all other vegetation. He's collected 600,000 seeds from healthy marsh plants and "broadcast" them in sparsely vegetated patches; and he's transplanted 2,500 plants taken from natural marshes.

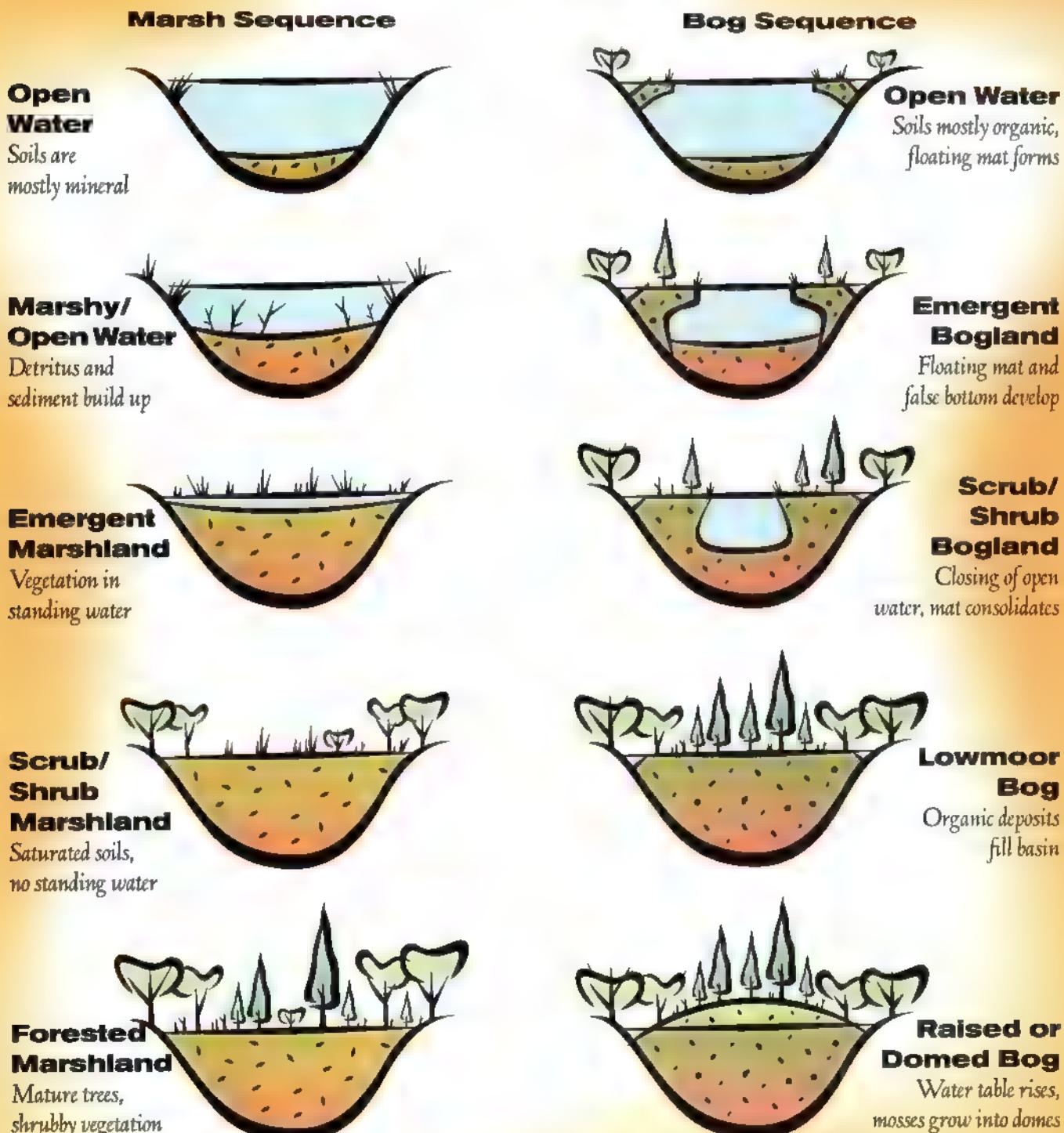
The extra effort expended in sustaining the marsh is all due to water. If hydrology is the driving force behind wetlands creation, it's got to go into overdrive to succeed in Colorado's semi-arid plains, where just 11 inches of rainfall dampens the soil each year, and every drop is owned by someone.

According to David Cooper, an



A Bog is Born

In his book *Wetlands*, William Niering recalls a dramatic but-true statement spoken by one of his professors. "All lakes are doomed to die!" As a lake or pond realizes its fate, a bog (or marsh or swamp) is born. The type of wetland that occurs depends on location, climate, land contour, water flow and quality, sediment composition, and other factors, including the influence of humans and beavers. ■ Lakes and ponds may go through a number of stages as they die: from open water to marshes with emergent plants, then to mossy bogs, to wooded swamps, and finally to forests and dry uplands. This process is called "succession." All freshwater wetlands do not necessarily pass through all successional stages — some may regress to an earlier stage. Under natural conditions, succession occurs over hundreds or thousands of years.



Sources: Wetlands, Alfred A. Knopf; "An Ecological Characterization of Coastal Maine," U.S. Fish and Wildlife Service; Maine's Natural Heritage, Down East Books. Adapted with permission from Down East Books, Camden, Maine.

authority on Rocky Mountain wetlands and the creation-project's principle investigator, the problem with the Arsenal's man-made marshes stems from one simple fact: they're six to eight feet above the water table. Lacking a natural water supply, the marshes depend on deliveries from the Highline Canal, which transports water from the Chatfield reservoir on Denver's west side. Farmers have first dibs, leaving the Arsenal to tin-cup the leftovers. Sometimes, the supply slows to a trickle. Other times, the marshes are deluged and the plants literally drown.

"People think that if a little water is good for a wetland, a lot must be better," says Dr. Cooper. "But wetland plants and invertebrates need a hydrological regime that suits them exactly. Some of those marshes have been filled more than 75 percent above the maximum allowable level. We've had 100 percent die-backs of some of the plants out there."

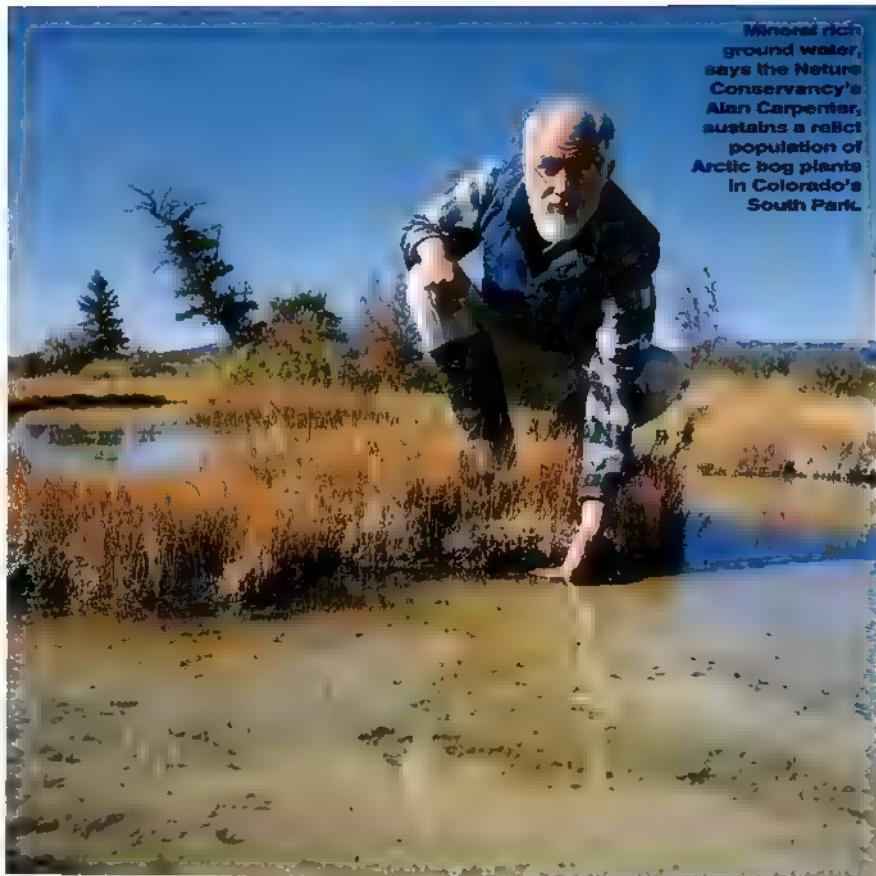
Dr. Cooper is blunt about the project's prospects for success. With its natural drainage that prevents it from overfilling, wetland #4 "seems to be working." But much of the plantings "haven't taken" in #1, which has an impermeable, clay-lined bottom which retains all inflows. Wetland #5 is "just a dry hole" — its sandy soil is too porous to hold water.

Although he's shotgunned scores of projects, Dr. Cooper is ambivalent about man-made wetlands. He says creation projects can succeed so long as the proper hydrological regime is established. But he's concerned that in our rush to achieve no further net loss of wetlands by building new ones, we're allowing entire natural wetland systems to fragment.

"You can't expect a created marsh or an open-water pond to duplicate all the complexities of a hardwood swamp," he says. "You might be getting an equal trade in terms of acres, but you end up with a net-loss of wetland type and function. We're seeing a complete switch in the kind of wetland systems that occur. It's simply not a good trade-off."

Peatland at 9,000 Feet

AFTER MUCKING AROUND IN MAN-MADE marshes, it was time to get my feet wet in a natural wetland. I found one in Col-



Mineral-rich ground water, says the Nature Conservancy's Alan Carpenter, sustains a relict population of Arctic bog plants in Colorado's South Park.

orado's South Park, a great bowl of land cradled by the conical, snow-crested peaks which form the Front Range on the east and the Mosquito Range to the west.

High Creek Fen "is the most ecologically diverse, floristically rich" peatland in the Southern Rocky Mountains, according to the Nature Conservancy, which acquired it in 1991.

The land here is sodden, unstable, dimpled with ever-undulating hummocks and hollows. Alan Carpenter of the Nature Conservancy leads the way, pointing out relict populations of Arctic and northern plant species, some of them not previously recorded in Colorado: myrtleleaf willow (*Salix myrtillifolia*), ragwort (*Senecio pauciflorus*), a moss (*Scorpidium scorpioides*), Colorado blue spruce (*Picea pungens*) jut up in isolated stands, ragged, spear-shaped. I tramp along after him, the springy earth quivering beneath my boots.

Dr. Carpenter explains that calcium- and magnesium-rich groundwater seep from a series of springs along High Creek, saturating the soggy lowland. The calcareous groundwater makes the fen

highly alkaline, which contributes to the great diversity of plants. As plant matter decomposes, rich, floating mats of peat capped with dense clumps of mosses accumulate at the rate of about one foot every 1,000 years. Scientists estimate it took some 8,000 years for High Creek's peat deposits to build up.

The glistening fen stretches across 714 acres, but my eye cannot quite take it all in. Up close, each tussock of sedge comes into sharp focus, as if intricately drawn. Look up, even for an instant, and it all dissolves into greens and burnished reds. Always, the fen's boundaries seem foggy and remote. And yet, all the reports I've read and all the anecdotes I've heard are vividly rendered: this fen could never be duplicated by man.

It's almost a given that in our jaunty pursuit of no net loss of wetlands, we'll continue to fashion "dry holes" and "steep-sided ponds." Only the best practitioners have figured how to take solid land and make it less and less like us, less amenable to us, and somehow, more and more like a spongy netherworld between land and water.

Is Garbage an Environmental Problem?

YOU REMEMBER THE MOBRO 4000, OF COURSE — THE INFAMOUS GARBAGE BARGE THAT COULDN'T FIND A PORT. WHEN FUTURE SOCIAL HISTORIANS LOOK BACK AT THE LATE-20TH-CENTURY'S GARBAGE OBSESSION, THE MOBRO MAY BE REMEMBERED AS A SYMBOLIC TURNING POINT, LIKE THE BULLET THAT STARTED A WAR.

The Mobro was a big barge laden with an increasingly ripe pile of waste. Plain old msw — household garbage — but it was from Long Island, lending it associations both with New York filth and suburban affluence. The story was that nobody would take it: no place to put the trash. But think for a moment. On every day of the Mobro's fruitless journey across oceans, municipalities from coast to coast continued to dispose of trash without incident. No other wandering barges appeared, nor have they since. What was the Mobro really about?

Entrepreneurial greed, according to Bill Rathje and Cullen Murphy. In their book *Rubbish!*, they explain that a guy with a get-rich-quick scheme saw a way to score a premium tipping fee for taking garbage he was sure he could dump for a lot less. His gamble didn't pay off, and off he went, desperately searching for profit.

Thus a symbol of environmental crisis turns out to be a symbol of something very different indeed. But how many people know that?

DOES GARBAGE HAVE AN ENVIRONMENTAL IMPACT? OF course it does, as does everything else, from prairie-

grass fires to your last exhale. Further, almost anything can become an environmental problem at a certain time and place, and garbage is no exception.

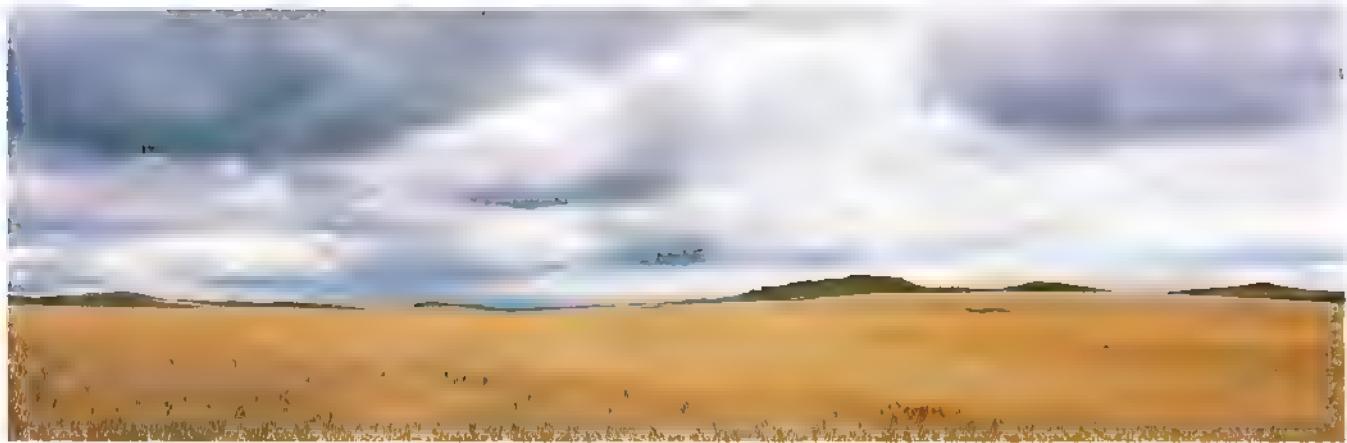
This essay questions the common portrayal (and thus public perception) of garbage as an environmental problem of relatively high magnitude, even crisis. I do not believe that garbage, or municipal solid waste (msw), is an environmental problem worthy of the attention it gets.

Furthermore, I believe there is a difference between garbage issues and environmental issues, and that the distinction is often blurred to the detriment of rational debate. For example, recycling to avoid disposal ("save landfill capacity") actually addresses a garbage issue, but is often portrayed as an important part of the environmental movement agenda. Why does the distinction matter? Here's one example: Many hard-pressed municipalities are now paying for curb-side collection of recyclables, sorting, and new transfer stations. From the standpoint of garbage management, these costs are often indefensible. But affordability and efficiency in garbage collection has taken a back seat as recycling became part of an "environmental ethic" viewed as necessary and politically unassailable.

From readers' letters, I know that the following assumptions are still held:

- that Americans make more garbage than we can technically manage in a responsible way;
- that trash has a major negative environmental impact in the form of toxic leachate from landfills and air pollution from incinerators;
- that recycling can solve the perceived problem of garbage's impact on the environment;
- that our garbage glut is proof that we use up too many resources, that we're a throwaway society, and

By Patricia Poore
PHOTOGRAPHY BY DAVID MAISEL



that we are going to run out of space to put the trash.

I believe these are misconceptions, and I'll explain why. Some critics argue that I shouldn't downplay the role of garbage on the environmentalist agenda because of its value as a symbol. I have a difference of outlook with those readers which can't be bridged with more facts. But I will say that a good, functional symbol is not one that loses merit when the facts are given. Nor should a symbol be used in a such a way that it diverts attention and money from more pressing problems.

The Difference Between a Garbage Problem and an Environmental Problem

AMERICANS MADE A LOT LESS GARBAGE THAN WAS PREDICTED in the past few years. The overriding reason for that was recession. A second reason was recycling. Some materials, notably newspaper, which would have gone to landfills or incinerators were instead collected, sorted, and shipped elsewhere. In some cases, recycling may have "saved" landfill space, but it didn't save money. The costs of consumer education, separate pickup (often in newly purchased trucks), hand- and machine-sorting, transfer stations, trucking, cleaning, and reprocessing were higher than estimates, far higher than receipts from buyers of recyclables — and higher than disposal costs.

At the same time, municipalities nationwide are struggling with a phenomenon called "put or pay," which means they pay the same high rates to an incinerator operator whether they "put" the contractual amount of garbage in or not. Some cities are forced to accept garbage from neighboring towns at a reduced rate, while their own taxpayers subsidize the incinerator. The incinerators were built to head off the landfill crisis, which turned out to be not a crisis at all, but a localized political problem due in part to our irrational fear of garbage.

IF THE QUANTITY OF GARBAGE TURNS OUT NOT TO BE A crisis, then what about its composition? Does some trash have negative environmental impact?

"Garbage is pollution when it is improperly managed hazardous waste, when it is litter, and when there is uncontrolled dumping," says expert garbage watcher Judd Alexander. "But garbage management as currently practiced does not contribute to pollution," he asserts, "because now even standard garbage is treated as hazwaste was 25 years ago."

He's referring to federal regulations that will codify into law safer dumping practices demanded by environmentalists and the public. Newer landfills are double-lined, piped, vented, leachate-tested, and eventually capped, regardless of the topography or geology of their site.

"New standards have made waste management safer by far than anything we have done for the past 200 years," Judd Alexander notes. "Regulations are probably unnecessarily stringent [since the federal government set national landfill standards]. The highest standards necessary in any location are applied to all, even in areas where geology doesn't demand it; that is, the standards are the same in a seaside location in New Jersey as they are in a desert hamlet in Utah or a small town in rural Kansas." Mr. Alexander sees benefits in higher standards, especially in the management of hazardous waste, but questions the relationship of benefits to cost in certain locales. "Landfills adequate to protect the public health [used to] cost \$6 a ton in tipping fees in much of the country; now it's a minimum of \$30 a ton, even when the higher standards were unnecessary to protect public health."

Even the categories of garbage perceived of as most worrisome are manageable. Although household hazardous waste accounts for only .8% of municipal solid waste, it presents a theoretical environmental threat. Many waste managers agree with environmentalists that the use of hazardous substances (heavy metals, solvents, acids and caustics, poisons) in common products could reasonably be reduced. Manufacturer processes and labelling could be better; consumers could be more aware of disposal options. Improvements continue.

Nevertheless, HHW is not as serious a problem as it once was. Again, the waste management industry has moved toward high standards for landfills, and the federal government has set the highest standards countrywide for the future. Simply stated, many sanitary landfills (and all of them after 1996) are operated to much the same standards as a hazardous-waste containment facility was a generation ago.

Industry experts estimate that up to three-quarters of the lead and cadmium in incinerator ash comes from batteries. These are not difficult to collect separately. Towns that burn their trash should have battery collection programs. As for heavy metals in pigments and as stabilizers in plastic products and inks: Packaging industries have substantially reduced their use in most products.

Today's mass-burn and WTE (waste to energy) facilities bear no relation to the original burners that gave incineration a bad name before 1960. Standards are extraordinarily high. Emissions go down every time advances in testing make it possible to detect ever-more-infinitesimal traces. Incineration may live or die based on economics, but it is not a public health hazard.

Garbage could most accurately be described as a complex but manageable issue that has been por-

trayed as a threat to the environment. As such, a garbage crisis may be nearer than ever before. But it is a crisis of misunderstanding, NIMBYism, spiralling costs, and mismatched "solutions" that create a financial and regulatory nightmare — not a crisis of environmental impact.

Garbage does not pose unusual threats to personal health. In that sense it cannot be called an environmental hazard. "People oppose incinerators and landfills because they don't want them in the neighborhood, and the political process shields those individuals from the economic consequences of their decisions," explains Jonathan Adler, an environmental policy analyst at the Competitive Enterprise Institute in Washington.

"The only threat posed by a landfill is a threat to land values or a scenic view. These are valid concerns. But they hardly justify federal legislation [based on the perception that they pose an environmental hazard]. Decisions about garbage-related trade-offs

Incinerators "weren't designed to be economic," contends Douglas R. Augenthaler, a trash stock analyst at Oppenheimer & Co. in New York. "They were designed to replace a disappearing asset [dumps] that didn't disappear."

[Yet] the [incineration] industry continues to use the mythical "garbage crisis" as a marketing tool. The industry group still talks of "solving the garbage crisis," though its president says in his speeches he has downgraded the "crisis" to a "problem."

"Fading Garbage Crisis Leaves Incinerators Competing for Trash," Wall Street Journal, August 11, 1993



should be made by those closest to the issue. In many cases, that won't require government involvement at all," states Mr. Adler.

Can Recycling Solve the Problem?

GIVEN THE EXTRAORDINARY EFFORT BY TOWNS, CITIZENS, waste managers, and industry to jumpstart collection and recycling, one would expect that recycling must be the answer to a very big problem. But what problem are we talking about?

Do we need recycling to extend the life of landfills? No. As we've seen, landfill sites are not scarce, the crisis didn't materialize, and incineration is a reasonable option. Even the most ambitious collection programs still leave well over half of MSW to be disposed of, so recycling cannot take the place of disposal facilities.

Do we need recycling to bring down the cost of disposal? Emphatically not. Landfills and incinerators today are regional in scale, and operate most

efficiently at high volume. We've seen no cost savings in sending a little less to the dump. Worse, collection and recycling programs are often more expensive to operate than other options.

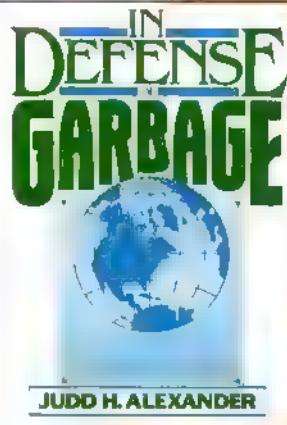
Do we need recycling to save resources? No, not in the real world. The reason recycling is unprofitable is because most of the materials being recycled are either renewable (paper from managed tree farms) or cheap and plentiful (glass from silica). Aluminum is profitable to recycle — and private concerns were already recycling it before the legislated mandates.

Do we need recycling to cut down pollution at the manufacturing stage, compared to the use of virgin resources? Ah... we may have something here. But that's no longer a garbage question. Its feasibility would be judged by different standards, material by material, and it would be subject to cost/benefit analysis.

Do we need recycling because it's ethical? This question goes to the heart of the matter; to say that

Another View of Garbage – Well Documented

JUDD ALEXANDER IS A VERY SMART MAN. To tap into what he knows, you don't need his phone number. He has taken the trouble to write it down, in a recent book titled *In Defense of Garbage*.



It helped me make difficult connections I hadn't yet worked out, such as that between use of resources and waste. The book is a must-read for legislators and citizens expected to make decisions about packaging, recycling, garbage disposal, or regulation; for educators and media people and pundits and anyone who believes in the power of environmental symbols.

It's a good read, too, a white-water trip through realities that defy conventional public wisdom on the issue of garbage-as-environmental-assault. His tone is arrestingly frank; garbage is not mundane when it brings up sharp-witted assessments of environmental and industry positions, or insights on society.

No question, Judd Alexander has a point of view, spoken with clarity and based on experience. Thus I found it worthy of my respect. I found it worthy of my attention because it is a voice often ignored in environmentalist rhetoric. Regardless of the reader's point of view, it will be hard to dismiss Judd's extensive documentation. One cannot help but learn something here.

Judd H. Alexander is a retired former executive vice president of American Can Company and of the James River Corporation, and former chairman of Keep America Beautiful, Inc. He's served as Adjunct Professor in the graduate school of Forestry and Environmental Science at the State University of New York.

The book is published by Praeger, Westport, CT. \$22.95 cloth.

- Disposal capacity; affluence; defining a problem
- Resources; "garbage" and conservation
- Packaging issues and innovation
- Source reduction; hazwaste; morality issues
- Recycling; science, politics, and markets
- Biodegradation, compost, and litter
- Collection and disposal systems explained
- Politics of garbage; risk assessment; solutions

garbage and recycling are not ethical issues is to utter heresy. But they are not. How is it ethical for a town to subsidize recycling while cutting the school budget?

Recycling proponents undoubtedly have their hackles up by now. I offer this caveat: I am not arguing the long-range benefits of recycling. I am addressing the role of recycling in solving a perceived environmental crisis due to garbage. Indeed, a future article will explore recycling success stories nationwide, and its relation to subsidies for virgin-materials extraction.

THE NEAR-EXCLUSIVE FOCUS ON RECYCLING AS AN ENVIRONMENTAL "good" creates other twisted outcomes. For example, proposed packaging legislation restricts product packaging to what is locally recyclable, or mandates a certain percentage of recycled content. These mandates give an inappropriate priority to lessening the amount of discard after use, even though garbage is a lesser environmental evil than, say, energy use. Such mandates limit opportunities for environmental improvement (such as source reduction and lightweighting) at the extraction, manufacturing, and delivery stages.

Is Garbage the Sign of a Throwaway Society, a Kind of Societal Morality Disorder?

AMERICANS DO USE A DISPROPORTIONATE SHARE OF THE world's non-renewable resources. This may be a good thing, a bad thing, or a neutral thing. In any case, the signs of our use are to be found in our closets, in living rooms and on highways — not in our trash.

Most of our garbage is made from renewable materials: 70% of discards are of paper, wood, leaves, grass clippings, food waste, leather, rubbers, and natural fiber textiles. Non-renewable materials including metals, glass, plastics, rocks, stones, soil, and synthetic rubber and textiles made up the balance, or 47.5 million tons. Compare that quantity to the 5.6 billion tons of non-renewable materials we claimed from the earth the same year.

What are the implications? The perception that our garbage contains large quantities of dwindling natural resources is incorrect. Therefore the "throwaway society" is a myth. We may be consuming and using vast quantities of resources, but we're not throwing them away.

More than any other resource, we are wasteful of fossil fuels. But they are not part of garbage. (Petroleum-derived plastics are a very small proportion of our use of oil. And the elimination of many products that do end up in garbage would actually increase the consumption of fossil fuels.) Cars have made us the civilization we are today, and that may be good, bad, or neutral. But certain-

ly those who feel a moral obligation to curb America's gluttony should concentrate on our burning of fossil fuels. Alas, compared to microwave trays, cars are a moving target.

Why Does it Matter?

MISPERCEPTIONS ABOUT GARBAGE HAVE AN UNFORTUNATE and regressive impact on producers and consumers. For example, the new advance disposal fee proposed in Florida for food containers will fall disproportionately on lower-middle-income people, because they are both the heaviest users of canned goods and beverage containers, and those who spend the highest proportion of their incomes on those categories. It amounts to a penalty; the upper-middle-income people who want to rid the world of packaging (for the wrong reasons) don't use those products to the same extent, and their use accounts for only a small percentage of their incomes.

Fifty-seven percent [in a 1990 public opinion poll] said they were willing to pay 15 percent more for groceries packaged for recycling (a premium of \$95 a month for an average family), but only 42 percent of the same people would pay \$50 a month more for electricity produced with reduced environmental damage. Think of that! The health risks and pollution effects from power generation are a far greater environmental threat than packaging discards. Serious environmentalists know this is true. How do they allow their messages to leave the public with such distorted priorities?

Judd Alexander, *In Defense of Garbage*, 1993



A growing chorus of voices warns that many of the rules, regulations, mandates, and disposal fees will cause the price of consumer goods to rise: Industry suppliers cannot survive without profit, so the consumer is ultimately the source of all money. Such hidden, passed-along costs are dangerous. Taxes (for garbage collection services, say) are subject to scrutiny and thus more controllable by the public than are upfront (but buried) increases in the cost of consumer goods.

We have to look at what we're spending and what we're getting for it. There is nothing wrong with spending money on environmental protection if it controls pollution, improves the quality of life, and protects our health. But it may be time for reconsideration when we realize that the U.S. spends 2.1% of its 5-trillion-dollar GNP on environmental issues, while Western Europe — often held up by American enviros as a model — spends 1/3 less than that.

Regulations and costs are burgeoning still.

Standards continue to reach for the impossible "zero impact" and "zero risk." Legal battles continue and lawyers get a disproportionate share of "environmental" money, because our laws are based not on science or real-world application, but on theoretical information subject to endless judicial interpretation.

"We have real environmental problems to worry about," Judd Alexander pleaded when I called to ask his views on garbage-as-symbol. "We have to protect the water supply. We must handle air quality better. We need a better plan for energy management. We must continue to monitor toxics with more efficiency. Even radioactive waste, for all the emotional overstatement, is a real problem.

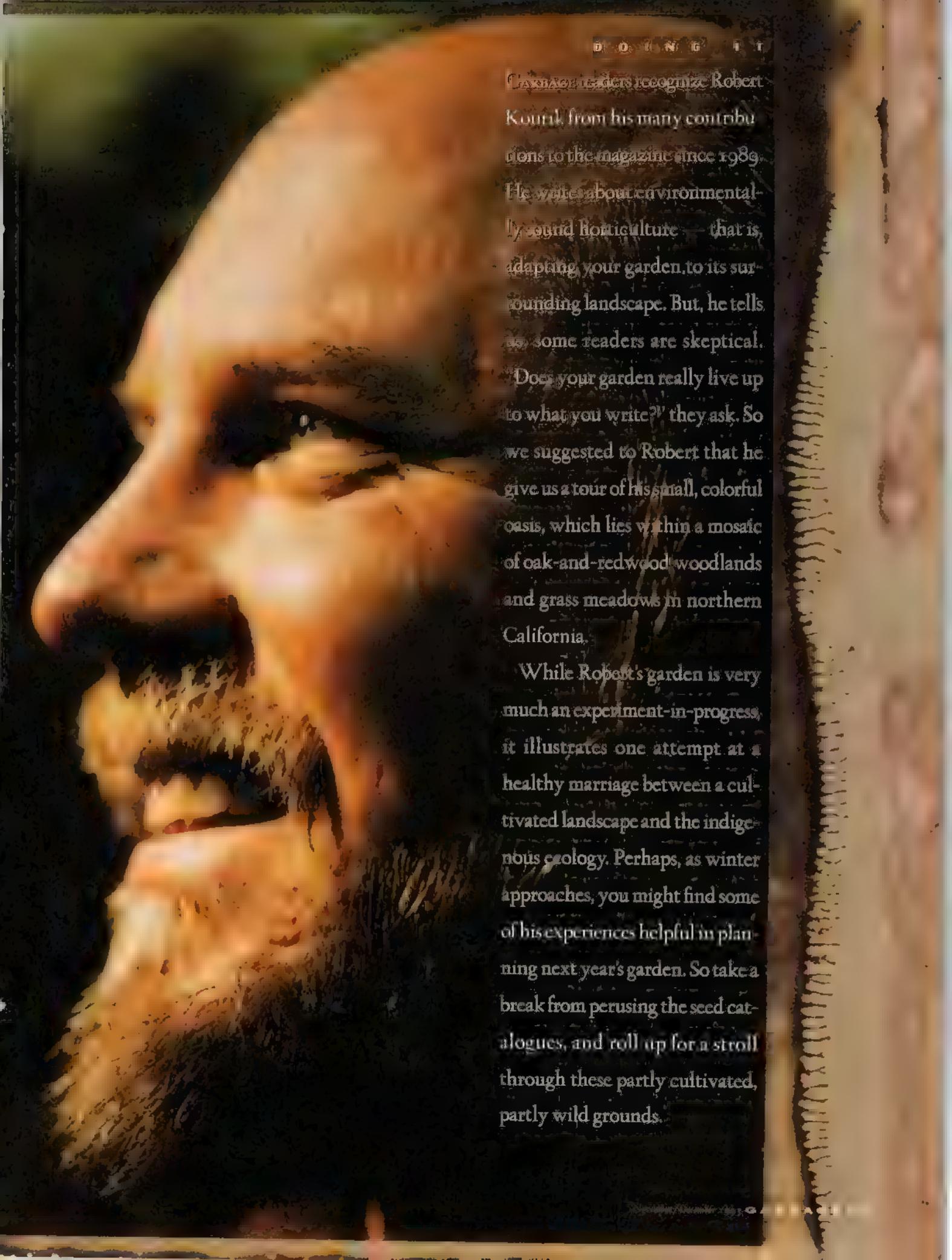
"In that context, it is foolish and extremely wasteful to spend so much effort wringing our hands (and spending our money) on garbage."

That's why it's important to put garbage in its place.

From Bare Ground

COME SEE COMPOST, XERISCAPES,
REUSABLES, AND EDIBLES AS
OUR OWN ROBERT KOURIK GUIDES
US THROUGH HIS ENGAGING,
IMPERFECT WORK-IN-PROGRESS.

PHOTOGRAPHY BY
CHRISTINE ALICINO



Claypeople readers recognize Robert Kourik, from his many contributions to the magazine since 1989. He writes about environmental design and horticulture—that is, adapting your garden to its surrounding landscape. But, he tells some readers are skeptical.

Does your garden really live up to what you write? they ask. So we suggested to Robert that he give us a tour of his small, colorful oasis, which lies within a mosaic of oak-and-redwood woodlands and grass meadows in northern California.

While Robert's garden is very much an experiment-in-progress, it illustrates one attempt at a healthy marriage between a cultivated landscape and the indigenous ecology. Perhaps, as winter approaches, you might find some of his experiences helpful in planning next year's garden. So take a break from perusing the seed catalogues, and roll up for a stroll through these partly cultivated, partly wild grounds.



THWARTING DEER DEFOLIATION

TO REACH MY GARDEN, YOU DRIVE NORTH of San Francisco along the Pacific Coast until the rural roads of Sonoma County become increasingly cloaked in second-growth redwood forest. Like reliable sentinels, a few remaining old-growth trees stretch 150 feet into the sky, their massive trunks measuring up to 16-feet wide. Here the dry summers, very wet winters, thin soil, winter windstorms, and moderate temperatures create a unique set of challenges for any gardener.

Not to mention the wildlife.

On my rambles through the countryside, I've spied bobcats, red foxes, deer, turkey buzzards, falcons, opossums, raccoons, and bats. While all this fauna is a joy to behold, some of the animals greatly complicate gardening in their territory.

MULCHED WITH NEWSPAPERS AND TURKEY BEDDING, THESE MOUNDED PLANTINGS OF HERBS AND ORNAMENTAL GRASSES HAVEN'T BEEN WATERED IN TWO YEARS.

Weather aside, nothing has shaped my gardening practices more than the four-legged mowing machines known as California mule deer. Controlling these wily animals by trapping or shooting is rather ineffective. My preferred method of thwarting incessant deer defoliation is fencing. (Two four-foot high fences, spaced five feet apart, work without making your garden look like a concentration camp.) However, I rent my property, and the considerable cost of deer fencing (at least \$5 per linear foot) is not an option. Out of sheer necessity I've learned to meet the considerable challenge of cohabiting the forest with half-domesticated deer.

I've adjusted to deer mostly by

planting the culinary herbs and various ornamental plants that they won't nibble. I've learned the hard way that most native plants aren't deer resistant, simply because deer have evolved here by consuming those very plants. Deer-resistant plants form a richly textured, informal edge along the curving path to my house. I've planted 15 varieties of rosemary (*Rosmarinus* species with white, pink, and many shades of blue blossoms); 20 types of lavenders (traditional blue-lavender *Lavandula* sp. flowers, plus pure white, pastel-pink, and lime-green flowering varieties); and various culinary or ornamental species of thyme and garlic chives. The herbs provide both flowers and foliage, plus plenty of tastes to experiment with when barbecuing.

Some plants, such as foxglove (*Digitalis purpurea*) and various euphorbias (*Euphorbia* sp.), are protected from deer by

THE MOUNDING APPROACH IS LIKE PLANTING DIRECTLY ON TOP OF A VERY LARGE, ACTIVE COMPOST PILE — THE PATHWAY PLANTS GREW LIKE GANGBUSTERS.

their poisonous compounds and are exclusively ornamental. Other plants appear to harbor an offensive taste to the four-legged Cuisinarts, but are neither edible nor poisonous to people. Examples include red hot poker (*Kniphofia uvaria*), summer lilac (*Ceanothus 'Julia Phelps'*), ornamental grasses (my favorite is *Stipa gigantea* with its eight-foot tall seedheads), five types of santolina (*Santolina* sp.), California native sages (*Salvia clevelandii* and *S. leucophylla*), and rockroses (*Cistus* sp.).

I'm a big believer in edible plantings, but the option of such a landscape surrounding my house has been eliminated by the cost of fencing, the free-ranging deer, and an inadequate well. I do have an informal planting of 22 fruit and nut trees, which produce 31 types of fruit because I've grafted nine varieties of apples to one tree. Each tree is surrounded by a five-foot-high cylinder, about ten feet in diameter, made of the heavy-gauge wire mesh used to reinforce concrete pads. Since a full-grown deer will stand on its hind legs to graze on leaves and fruits, each tree is enclosed until a good portion of the fruit-bearing canopy has grown to above seven feet. The orchard is mulched with old pieces of carpet (camouflaged with wood chips) to suppress the blackberry vines and poison oak which normally thrive here. (See "The Fine Art of Mulching," Aug./Sept. '93, for more on carpet, newspaper, and other mulches.) The sole source of irrigation for the trees is the greywater from my shower, tub, and bathroom sinks.

RECYCLING GARDEN WASTES

THE ENTRY PATH TO MY HOUSE WAS formerly a swampy spot during heavy winter rains. I didn't want to re-route the surface runoff with complicated drainage piping, so I formed a mounded planting area along each side of the path and dug a shallow "creeklet" on the wettest side.

This project was originally an experiment in "no-till" gardening — an attempt to learn more ways to improve my clay soil for drainage for plants and keep the pathway from flooding without



A MOUNDED PLANTING AREA NEXT TO MY "CREEKLET" IS TOPPED WITH LION'S TAIL AND GRAY AND GREEN SANTOLINA, WHICH RESIST DEER AND DROUGHT.

the tiresome effort of spading and cultivating. In the process, however, I discovered that I could heap piles of garden "wastes" to get plenty of winter drainage and grow beautiful ornamentals.

I began by piling horse-stable sweepings (mostly manure and straw) and turkey bedding (wood chips, rice hulls, some sand, and turkey poop) about 18 inches high by two feet wide, and thoroughly watered the entire mound. Next I dug a large pocket out of the mound, filled it with some pot-

THE WATER IN MY FISH POND IS CIRCULATED BY A SOLAR-POWERED PUMP. PONDWEED AND A WATER LILY HELP CUT WATER LOSS THROUGH EVAPORATION.



ting soil, and set the plant. After planting, I watered everything again, then covered the mounds with five to ten sheets of newspaper topped with four or more inches of composted, weed-free turkey bedding.

The mounding approach to gardening is like building and planting directly on top of a very large, active compost pile. The pathway plants grew like gangbusters, with the mullein (*Verbascum* sp.) and foxglove flower stalks reaching the six-to-nine-foot range. The drainage problem was solved because the plants were well above the flood-prone surface soil. But for the first two years the mounds required more summer irrigation than conventional soil-based beds, probably because of the lack of clay to retain moisture. To eliminate the need for extra summer watering, I turned to a different area of my garden.

NO-IRRIGATION GARDENING

UNTIL RECENTLY, THE TERM "XERISCAPE" (pronounced zir'-i-skap) was trademarked by the National Xeriscape Council, which promotes drought-resistant gardening. One of the Council's goals was to achieve a "savings of up to 75 percent on the water used for outdoor irrigation." I always wondered, why just 75 percent? Why not shoot for a 100-percent reduction in watering? Sound like shooting for the stars? After five years of trial and error, I've come up with a mound-and-plant system which requires no additional irrigation beyond the day of planting — even, as in my case, with a normal dry season of six months that recently was extended by the most protracted California drought in more than a century.

My "research" plot borders a creeklet that runs along the yard's west side. To begin such a planting scheme, I stockpile chunky wood chips (not sawdust, which settles and stifles drainage) from local tree-trimming services, avoiding any material that might easily resprout — such as willows, acacias, alders, various vines, or bay laurel (*Umbellularia californica*). I let the pile of wood chips rot over several months,

HARVESTING THE FOG

MY HOUSE IS NESTLED NEAR THE TOP OF A RIDGE which divides the dryer, inland Santa Rosa plain from the more temperate Pacific coastline some five miles to the west. The combination of cool, foggy coastal breezes and the 1,100-foot elevation creates a micro-climate that we locals call the "banana belt." While I can't actually grow bananas, the winter temperatures here seldom drop below 27° F. (the record low for the past 20 years is 15° F), allowing for the cultivation of semitropical delights such as kiwis, lemons, avocados, and pineapple guavas.

The average annual rainfall on top of my cloud-grabbing ridge is 60 to 70 inches. The rains extend pretty much from October through April and summers are almost completely parched. My Mediterranean summers are dry, however, only when measured by traditional rain gauges in open fields.

Despite the near-rainless summers, on foggy summer evenings I can hear the sound of steady "rainfall" beneath the tallest trees. The forest floor is often moist in warm weather, even though a nearby field remains bone dry. I've learned that in the coastal zone, the summer "rain" consists of droplets falling from fog. The cool, moist air condenses on the leaves of plants and forms droplets similar to the beads of "sweat" on a bottle of cold soda. Douglas fir needles offer a comparatively large surface area for condensation, and the droplets easily fall from the needles.

Intrigued by this relatively unstudied phenomena, I've set up several rain gauges beneath the tallest (125 feet) Douglas fir tree near my garden. Over the past six years, I've discovered this single tree gathers one or more inches of "drip irrigation" every night during heavy fogs. A typical six-inch "fog drip" during the month of August

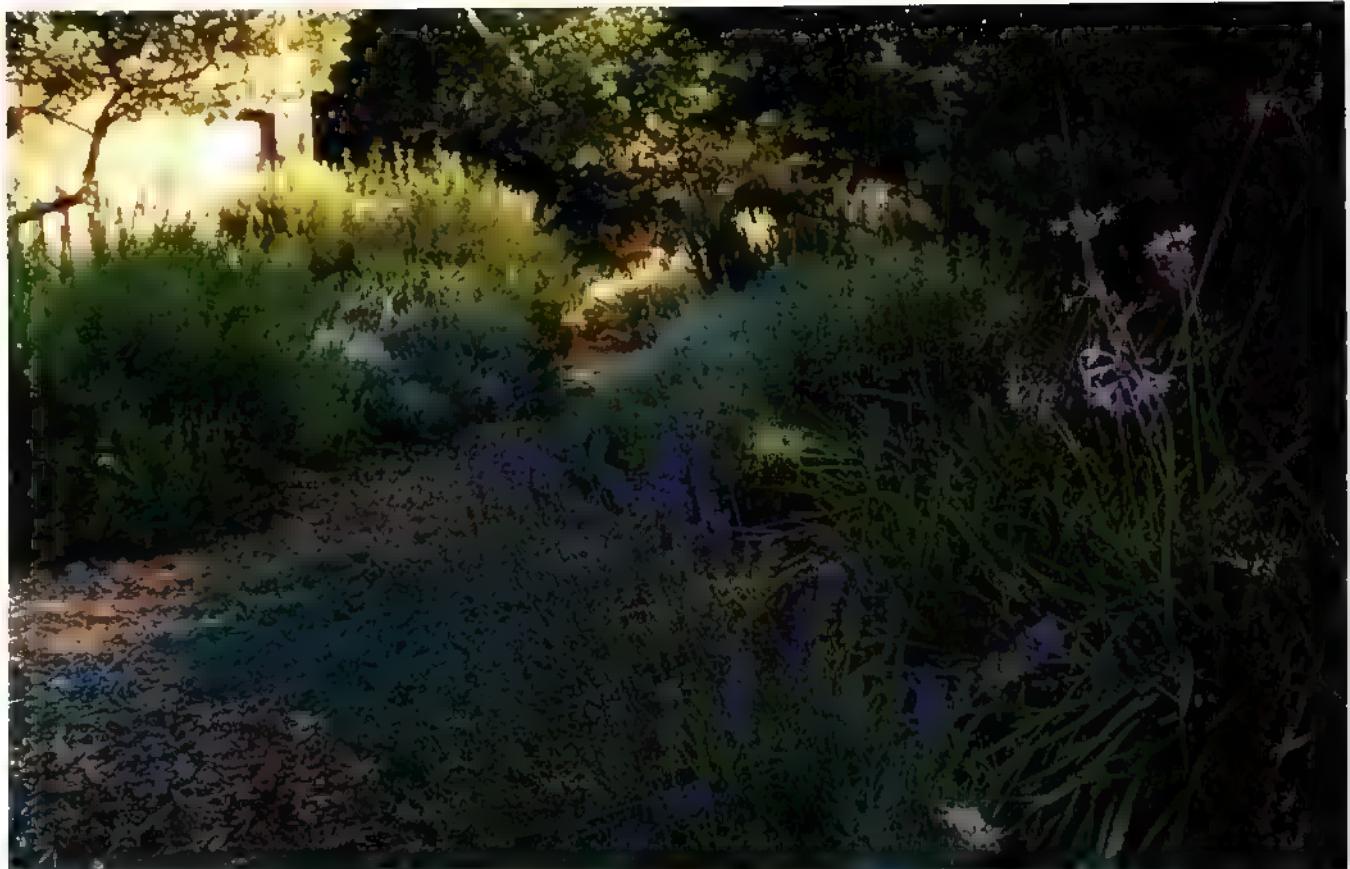
equals an amazing 163,000 gallons (per acre of tree foliage) of summer rain!

If I owned the place, I'd build a cistern beneath my fog harvesting tree. The cistern would have a funnel for a roof to capture summer "rainfall." If the cistern's roof were a mere 225 square feet, the typical six-inch August fog drip would yield 837 gallons of stored water for me to use in parts of my landscape where fog drip lacks influence.

Since I don't want to build a cistern, I'm planting beneath the dripline of the Douglas firs on trees near my patio. This allows me to utilize the original drip irrigation for effortless summer irrigation. Ah, but the rub is finding plants that are somewhat drought-tolerant, shade loving, and deer resistant. This narrows the list considerably, but so far most of the varieties of Daphne (*Daphne* sp.), wild ginger (*Asarum caudatum*), native Western ferns, huckleberry (*Vaccinium ovatum*), and various ornamental grasses are the best performers.



RAIN GAUGES SHOW THAT MY TALLEST DOUG FIR CAPTURES AN INCH OF MOISTURE EVERY EVENING DURING HEAVY SUMMER FOGS.



which, one hopes, kills any sprouts. I also keep close watch for highly allelopathic foliage, which stunts or kills nearby plants. Local examples include black walnut (*Juglans nigra*), sagebrush (*Artemisia californica*), and mesquite (*Prosopis glandulosa torreyana*).

My favorite chips are oak, which really seem to attract worms. (They burrow into the chips, creating pockets which improve drainage.) Conifers, pines, and Douglas fir (*Pseudotsuga menziesii*) trees are acidic, resistant to decay, and therefore much less preferable to hardwood chips such as oak. I also think the terpins and resins in coniferous species are a bit rough on plants, so I allocate them to the mulch covering the used carpet on my rustic pathways.

Basically, I've built an active compost pile and planted directly on top. Because tree chips are so high in carbon, I always layer them with manure. I start the bottom of the mound with chips six inches or longer. This prevents the pile from settling too much and helps keep the whole mound slightly aerobic. For the subsequent layers I use a blend of

CAREFREE PLANTINGS SPILL OVER THE PATHWAY TO MY DOOR. A CARPET-MULCH TOPPED WITH CHIPPED TREE TRIMMINGS KEEPS POISON OAK AT BAY.

smaller chips (1/2-inch to six inches long) and manure.

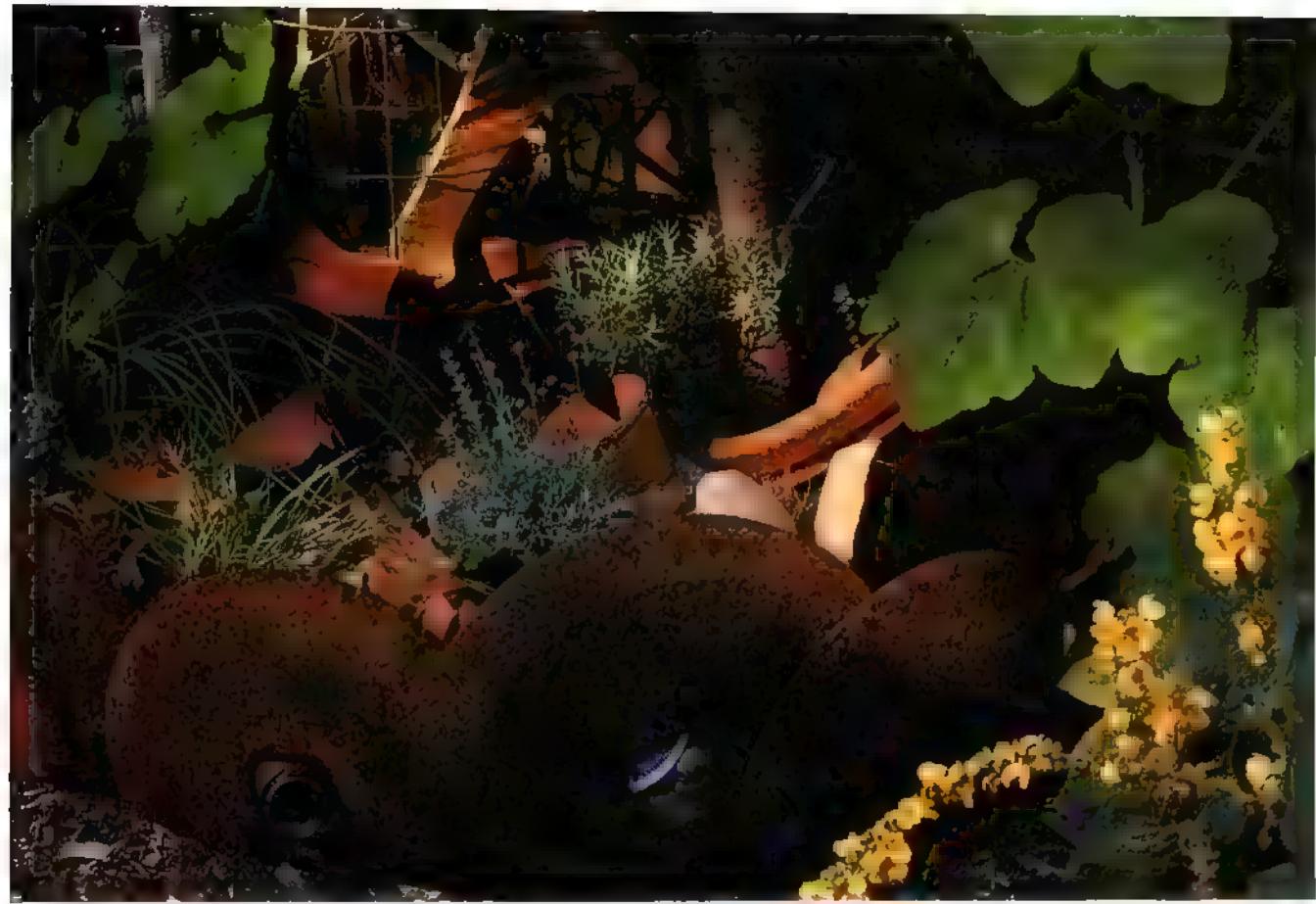
I'd guesstimate that a good starting ratio for your own experiments would be one part manure to three or four parts chips. You can use other types of high-nitrogen materials — wet kitchen scraps, sludge, fresh grass clippings, green-manure crops like buckwheat, vetch, bell beans, and clover — to help decompose the woody chips. The more nitrogen you add, the faster the mound will decompose and the greater the nitrogen supply for the growing plants. I pile this mixture of high-carbon and high-nitrogen materials at least one-third higher than I want for the final mound, and sometimes up to double the height (since it will settle). I water each layer as I go and make sure all material is moist.

Next, I cover the mound with a soil cap at least four inches thick (the thicker the better). I often use a mixture

of 50-percent rotted turkey bedding and 50-percent native soil for the top layer. (I excavate soil from a place where I want a new mini-creek for winter drainage.) The soil cap insures good drainage, a neutral soil temperature, balanced nutrition, and good initial growth for the transplants. The plants are set in the soil cap and watered thoroughly. Again, newspapers and turkey-bedding mulch are used to cover the soil cap.

Once the mound starts rotting, the plant's root hairs will follow the decomposition to take advantage of the newly available nutrients. Plants are "smarter" than we often acknowledge; their roots won't grow into areas that are too hot due to thermophilic (hot) decomposition over 110° F. The plants also appear to get some benefit from the subtle amounts of heat that the mound generates, like the enhanced growth in a bottom-heated seedling tray. Remarkably, all the plants established themselves with just a single watering after planting.

After five years, my research mound's chips had decomposed, the soil settled to a lower level (less than 18



inches high), the shrubs rooted fully into the native soil, and the new mound became a wonderful, curvilinear feature alongside the new little creeklet. Because enhanced drainage would appear to make plants prone to summer drought, mounded plantings seemed to be a heap of contradiction at first. Now they've become one of my preferred techniques for quick, no-till soil development. They are also a cheap way to create instant soil drainage and a truly drought-resistant landscape.

TO CUT WATER USAGE, IMPROVE DRAINAGE?

AFTER THE FIRST SUMMER PLANTING, I discovered that the plants which capped my new mound required just monthly irrigations. The following summer it needed just two waterings — and no additional water since. The plants

A PLANTING BED IS DEFINED BY PLOW DISKS AND A WIRE TRELLIS, WHICH HELPS SUPPORT A DEER-RESISTANT CHI-LACAYOTE VINE.

looked great, but I felt their drought tolerance could be improved even further.

With subsequent plantings of rosemary, lavender, santolina and the ornamental grass *Stipa gigantea*, I experimented with mounds just 12 to 18 inches high and no summer watering. The jury is in: The plants appear as healthy and as fully-grown as similar plants along the main pathway which are drip-irrigated twice monthly. Conversely, the mound's drainage has kept the plants from drowning during extremely wet winters.

Ironically, the greater the drainage, the easier it is to grow plants without irrigation. My theory is the enhanced drainage allows the roots to

easily follow the dwindling moisture supply each summer. Heavy, clay soils are so stiff they retard root-growth and moisture quickly slips away from the roots. At any rate, the best looking "dry-farmed" corn — that is, grown without any irrigation — in Sonoma County comes from the sandiest soils.

The thought of growing beautiful ornamentals without any supplemental irrigation frightens most gardeners. I know of just one other landscaper who has even attempted to grow a truly xeric (dry) landscape, and he was quite successful. Why no one else wants to save this much water, not to mention the time and expense of watering, is beyond me. An unirrigated landscape is cheaper, more "natural" than the conventional garden, and requires less work. Not a bad recipe for our busy modern lives.

THE THOUGHT OF GROWING BEAUTIFUL ORNAMENTALS WITHOUT ANY SUPPLEMENTAL WATERING FRIGHTENS MOST GARDENERS. WHY NO ONE ELSE WANTS TO SAVE THIS MUCH WATER IS BEYOND ME.

THE GARDEN AS REUSE CENTER

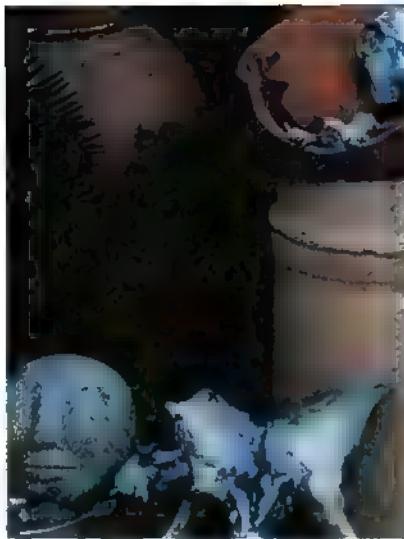
IT USED TO BE THAT I WAS TOO BUSY GARDENING in my other gardens to enjoy the results. Visitors would stand around awkwardly because there was no place to relax. Not in this garden. Here, recreation and barbecuing take precedence.

In Midwestern traditions, the measure of your hosting ability is gauged by the quantity of the food you offer your guests. For me, true hospitality is measured by the quality of the barbecue. My landscape centers around the circular barbecue and grill made of found objects: used slate and tiles, broken terra-cotta pottery, clay drain tiles, and recycled bricks. Behold my brick-lined pit: The nation's only permanent bean-bakin' device. A wide circle of swept sand, complete with a "fossilized" dinosaur spinal column (actually an abandoned ceramic sculpture) defines the bean hole and prevents wayward barbecue sparks from igniting a brush fire in this fire-prone area.

The eating and sitting areas are surrounded by a bright red cloudburst of unirrigated Italian poppies. Seating options include chairs once destined for the dumpster: a picnic bench, an Adirondack chair, a French garden table with green slatted chairs, several straight-backed, moss-covered seats hewn from fallen logs, and a Victorian-styled tea table and chairs with a foliage motif — all set in different nooks, recesses, and alcoves throughout the garden and nearby forest.

Living in California, for many years I despised what seemed to be the extravagance of a water feature in a garden. About halfway through the most recent drought, I finally relaxed enough to accept the apparent contradiction: I built a 3' x 4' fish pond with waterfall just outside my writing studio.

Now, as I write with the window ajar, the rill's pleasant sound drifts up like a gentle mental massage. I add less than 25 gallons per week to compensate for evaporation; this small amount of water has no major impact on my well. In return, the water lilies, catfish, crappie, mosquito fish, and visiting birds and deer provide many delightful opportunities to observe wildlife behavior.



FOR ART'S SAKE, I'VE PLANTED SWORD FERN AROUND FOUND OBJECTS LIKE SCULPTED BEACH STONES AND DEER AND COW BONES. (DEER NOT KILLED BY AUTHOR.)

LOW-MAINTENANCE GARDENING

FOR ME, THE MOST PLEASANT ASPECT OF MY garden is the small amount of time it takes to care for it. The total portion of my landscape that's devoted to plants amounts to about 1,000 square feet. Of this area, almost fifty percent is either mulched pathway, patio, or completely unirrigated plantings. The remainder (two mounds and some adjacent perennial plantings) is watered with a drip irrigation system which uses in-line emitter tubing and is turned on manually

GARDENING ON SNOOZE CONTROL: THE RIGHT PLANNING MEANS PLANTINGS NEED LITTLE MAINTENANCE — FREEING TIME FOR LESS TAXING PURSUITS.



once every two weeks. (See "Drip Irrigation," May/June '91.) A series of container plants along the south side of my house is drip irrigated with "spaghetti" tubing and 1/2-gallon-per-hour emitters. An automatic controller waters the containers every day for 10 minutes, or just 6.4 ounces (less than one cup) per emitter.

All my initial attention to water-conserving planting techniques, deep mulching, drip irrigation, and choosing low-maintenance evergreen plants keeps my total yearly maintenance effort to less than 20 hours or so. If my place was all lawn — which would consume considerably more precious well water than my current design — it would actually take 25 percent less time to care for (mowings included). But a lawn is considerably less enjoyable, less tasty, and visually boring compared to my seasonal palate of color, spice, and foliage. A thousand square feet of roses, in comparison, would take 180 hours of repetitive and tedious pruning, heavy waterings, and extra fertilizer. Compared to most gardens, mine takes a fraction of the effort and maintenance.

My garden's intensive plantings do require appreciation of a certain aesthetic. I once had an old friend ask tactfully, "Did you *mean* to have so many plants?" I place each plant 40 to 60 percent closer than garden books recommend so a shady, weed-suppressing canopy soon covers the entire mulched area. My plants bump into each other, climb on top of others, mingle, and intertwine. I enjoy this wild and woolly landscape. I see little symmetry or predictability in the forest which surrounds my humble planting. I figure that evenly spaced, well-clipped plants would be a rude affront to the delightful casualness of the surrounding natural areas.

Tourists sometimes treat me like some kind of gardening expert and seem to expect a "perfect" garden at my house. No chance. I enjoy gardening, but the garden is no longer a tyrannical dictator of my free time. I'm exploring a new aesthetic which embraces a measured amount of pleasant untidiness, and leaves plenty of time for other recreational pursuits.

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Keepers

A New Lease for Fleece

OUTDOOR ENTHUSIASTS can now wear their environmental sentiments on their sleeves. Patagonia is rolling out a line of sport fleece sweaters made from 80-percent recycled soda bottles.

By now, most people have heard that old bottles can be made into carpeting and ski-jacket stuffing. But Patagonia's high-performance, richly colored tops represent a milestone in recycling.

The fabric, called Fortrel EcoSpun, was developed jointly by Wellman, Inc. (the recycled-carpet people), Dyersburg Fabrics, and Patagonia. While a 100-percent recycled sweater is certainly feasible, Patagonia held out for 20-percent virgin fiber to ensure softness. Even so, the weave isn't quite as cushy as the virgin product it replaces.

Yes, replaces. Patagonia isn't adding a line, it's eliminating virgin fabric from some garments and replacing it with recycled. The sweaters will be la-

belled PCR Synchilla, for Post Consumer Recycled, and beginning this fall is available for \$85 in catalogs and stores. Other outdoors stores are in hot pursuit — L.L. Bean plans to offer a recycled fleece in early '94.

For a Patagonia catalog, call (800) 638-6464

Rate Your Plate

THE PREPONDERANCE of garbage offered, in the guise of food, to children is extraordinary. What's a kid to do? "Get off your butt and grab some exercise!" Just one bit of advice from the Rate Your Plate poster.

Ideally, kids get hooked by the poster's snappy lines and bright illustrations. A couple hundred foodstuffs, from condiments to vegetables, snacks, and drinks, are presented in fun form: dairy foods are printed on a cow, burgers are locked in "Junk Food Jail" for crimes against the body, and the "switch-a-roo" machine takes donuts and chips in one side and spits fruit and bagels out the other. Some great graphics illustrating the sugar content of cereals, and



the fat content of fast food, bring the point home.

For each food, amounts of fat, cholesterol, salt, sugar, and caffeine are weighed against vitamins, iron, calcium, protein, complex carbs, and natural sugars. The result is a numerical score: Orange juice scores +55, cream cheese -52, turkey on wheat with mustard +14. Curious? The highest score is a sweet potato, baked with the skin, at +184. The worst, at a tragic -183, is Ben & Jerry's Heath Bar Crunch ice cream.

While kids cannot live by sweet potatoes alone, the numbers will start them thinking about balancing their plates in favor of good health.

\$5 (\$10 laminated) from

CSPI — Rate Your Plate, Suite 300, 1875 Connecticut Ave. N.W., Washington, D.C. 20009.

Write Me Tender

CHCK THIS OUT: YOU CAN end-run your bank, get your checks printed on recycled paper with pretty nature stuff on them, and make a contribution to an environmental group — all in one.

Message!Check thumbed its nose at the banking industry in 1988 by offering to print checks for individual clients. Working with

an environmental or social group, the company designs checks with pretty pictures and a short blurb. When people buy the checks, 9 to 11 percent of the gross goes to that organization — totalling \$1.5 million so far.

Now the company has added recycled content to its products. (Most of the big check printers have added a recycled line, too — ask your bank to show you theirs.)

You needn't be a member of the organization (which include the Sierra Club and Audubon) to start passing good checks. The checks are bound in five books of 40, rather than eight books of 25, in order to save binding paper and glues. They're printed with soy-based inks.

Cost is \$14 for 200 checks. For a list of design options, or to order contact Message!Check, P.O. Box 3206,

Seattle, WA 98114; (800) 243-2565.

Furry Bears

HAVE ONE. A FRIEND OF mine has two. Even in the nation's most politically correct closets hang the fading pelts of various little mammals, stitched painstakingly into that status garment, the fur coat.

But wear it out to dinner these days, and your own pelt may be on the line. Although people who don't spay or neuter their cats visit infinitely more pain and misery on the animal kingdom than do purveyors of mink, it is on

fur coats that the wrath of animal sympathizers descends — most commonly in the form of ketchup.

Well, you can do like me and put on your fur once a year, pull the shades and prance around your house. Or you can give it a new home, where it will be recycled, appreciated, and useful. The McCrory Bears company takes old fur coats, turns them into new teddy bears for sale, and gives half the profit to the Kidney Foundation.

If you're not ready to give your mink away, you can have the McCrorys (a husband-and-wife team) make a big bear just for you, from your own coat. Don't quail if you don't have mink: McCrory Bears can be reincarnated from muskrat, possum, fox, sealskin, and Persian lamb.

Wouldn't only the most unenlightened troll be caught in possession of a fur bear? The McCrorys argue that a fur used for fundraising gives the varmints' lives a little more meaning than they had hanging in the closet. The bears start at \$100.

To donate or order, contact the Kidney Foundation at (800) 542-4001. Or you can write The McCrory Bears at P.O. Box 305, Rockport, MA 01966; (508) 546-2385.

Solar Tweeter Pleaser

IF YOU'RE THE SOFT-HEARTED type who hopes to save your feathered friends from pecking at frozen puddles in the winter, it's time your yard offered a solar waterer.

The Solar Sipper

is built a little like a Thermos, with air as

insulation between two layers of plastic. But it's



the black plastic lid that does the work, collecting solar energy. In good sun, the combination keeps water liquid at 20° F. air temperature.

There's a hole in the lid for the little heads of your friends. In the summer, take the lid off and use the Sipper as a waterer or a simple feeder.

The Solar Sipper comes in basic black (\$19.95) and berry red (\$22.95). (It contains no recycled plastic.) Add \$10 if you want the sturdy black mounting bracket, and \$4 for shipping. Contact the Happy Bird Corp., P.O. Box 86, Weston, MA 02193; (617) 899-7804.

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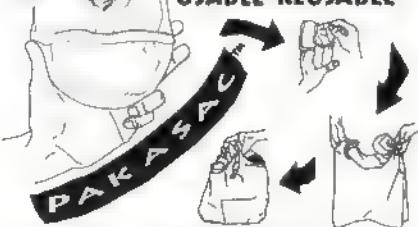
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RESOURCES

The Greenpeace Guide to Anti-Environmental Organizations

by Carl Deal. 110 pages. Odonian Press, Box 7776, Berkeley, CA 94707; (800) 732-5786. Softcover, \$7.00 ppd.

AT A WISE-USE CONFERENCE in 1988, says Greenpeace, participants generally agreed that the destruction of the environmental movement was a worthwhile undertaking. In this book, Greenpeace lists every group they put in that category.

Whether all groups list-



ed really are "anti-environment" is subject to opinion. But of some intrigue are the chameleonesque names they bestow on themselves. Would you guess, from these

names, what the group's goals are?

The Abundant Wildlife Society of North America: formed to prevent the restoration of wolves to Yellowstone.

The Evergreen Foundation: disputes forestry science and regulations.

Information Council for the Environment: coal-mining interests who dispute global-warming information.

National Wetlands Coalition: lobbies against wetlands protection.

The Sea Lion Defense Fund: formed to support bigger fishing quotas on pollock, the sea lion's main prey.

Greenpeace lists 50 organizations and groups, along with their purported goals, the corporations that fund them, and contact people.

.....

Environmental Literacy: Everything You Need to Know About Saving the Planet

by H. Steven Dashedsky. 298 pages. Random House Order Dept., 400 Hahn Rd., Westminster, MD 21157; (800) 733-3000. Softcover, \$12.72 ppd.

THE FIRST THING YOU need to know about saving the planet is that you'll never know everything you need to know. In fact, "saving the planet" suggests that it's the Earth, not the human

ENVIRONMENTAL LITERACY



THE A-Z GUIDE

H. STEVEN DASHESKY

race, that's in jeopardy.

Nonetheless, this is a wonderful encyclopaedia of terminology. From acid rain to zooplankton, the definitions are succinct and devoid of hysterical interpretation: *albedo*: The portion of solar energy that's reflected away by dust particles and clouds. *oology*: The study of eggs. *zoonosis*: A disease that can be transmitted from animals to humans.

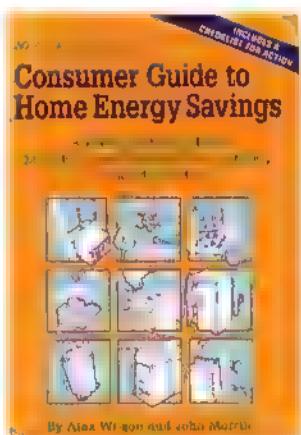
Whether you're a zoologist or an eco-conservative, you'll find dozens of words here you never saw before, from brand-names like Zoo Doo to organizations like Rails to Trails.

Consumer Guide to Home Energy Savings

243 pages. American Council for an Energy Efficient Economy, 2140 Shattuck Ave., #202, Berkeley, CA 94704; (510) 549-9914. Softcover, \$8.95 ppd.

THE LATEST EDITION is out — get yours while it's hot. This little guide is a must-have for anyone in the market for new appliances. It's advised reading for anyone with an energy bill.

It provides a brand-by-brand listing of every appliance, from the furnace to the dishwasher and water heater. But that's just the beginning. Between these covers is everything you need to know to weatherize, economize, build, or upgrade your whole domicile. Also included are the reasons you should care a whit: wasted energy translates into air pollution, acid rain, and CO₂. Not to mention money. The same pub-



lishers have also come out with a book on office equipment. This 85-page guide covers everything from copiers to fax machines and computer monitors and printers, listing the energy-saving features you should look for. *Guide to Energy Efficient Office Equipment*, \$10 ppd.

—Reviews by
Hannah Holmes

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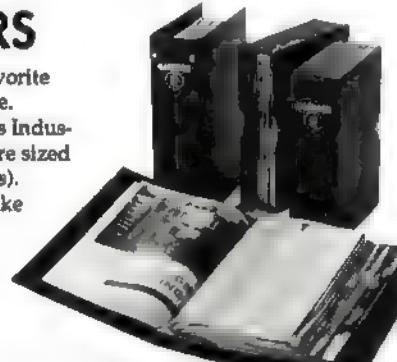
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I've Got the "What's On My Blueberries" Blues

IS THE WHITISH FILM ON BLUEBERRIES NATURAL OR PESTICIDE?

— SASHA SUMNER, BROOKLYN, NEW YORK

I'D ALWAYS WONDERED ABOUT THAT, TOO. THEN I STUMBLED ONTO blueberry heaven by the side of a beaver pond last summer and found bush after bush laden with corpulent, filmy blueberries. My intuition was later confirmed by Wesley Autio, associate professor of pomology at the University of Massachusetts: The coating occurs naturally and is perfectly fine to eat.

The white film is a waxy cuticle called the "bloom." Most fruits with smooth skins have them — when you polish an apple you are wiping off its bloom. It is thought that they serve to retain moisture.

While know-nothings like us suspiciously wonder if the bloom is pesticide residue, bloomless blueberries tend not to sell as well. According to Professor Autio, many vendors avoid refrigerating their blueberries — even though they would last longer stored cold — because moisture condenses on the blue skin and removes the bloom.

Disposal for Pressure-Treated Wood

Isn't pressure-treated lumber saturated with arsenic? What's the safest way to get rid of it?

MARK NOWOTARSKI
Stamford, Conn.

COMMERCIAL PRESSURE-TREATED LUMBER comes injected with various chemicals, none of them particularly benign. Of course, that's why people buy it: Pressure-treated lumber is used for outside projects like decks and boardwalks, where chemical preservatives protect the wood against insects and rot.

popular solution is the toxicant pentachlorophenol (penta for short). Wear gloves and a dust mask when you work with treated wood, and clean up any sawdust you may leave behind.

Before tossing treated lumber, consider reuse. If you have a good-sized load in reasonable condition, your local high school's woodshop may be able to use it. Or contact the local chapter of Habitat For Humanity, an organization that builds housing for poor people. The last thing you should do is burn the stuff in your wood stove or fireplace, where arsenic and metals such as chromium and copper would concentrate in the ash. And don't



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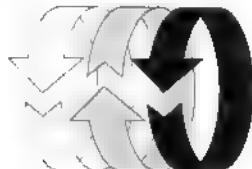
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leave the wood around in a scrap pile where someone else might haul it away for firewood.

There are no perfect disposal options. The federal law (RCRA) defining hazardous waste exempts pressure-treated wood, even if tests detect chemical levels high enough to qualify it as hazardous. As a result, most states allow pressure-treated wood wastes to be dumped in standard msw landfills.

How safe is the landfill option? Tests on leachate (water that percolates through a dump) from landfills that contain construction/demolition debris (and thus, pressure-treated wood) show traces of arsenic, lead, copper, and chromium, among other threats to groundwater. Is the leachate from c/d landfills any more toxic than the leachate from landfills without c/d debris? This much is certain: Well run, modern landfills collect and treat landfill juice — a leaky landfill is a significant problem, regardless of whether pressure-treated wood is contributing to leachate.

Most wood recycling companies that accept pressure-treated lumber simply chip it to sell to incinerators. A study on c/d debris prepared for the Northeast Waste Management Officials' Association concludes that incinerators can keep emissions from burning treated and painted wood "below regulatory standards when conventional particulate collection devices are used." Although incinerator scrubbers can keep air emissions down, pressure-treated lumber will add to concentrations of heavy metals in the bottom ash.

Bioremediation (where microorganisms ingest and volatilize chemicals) of penta wood may become feasible in the near future. Meanwhile, if you can't find a way to reuse it, don't feel too bad about sending it to the dump. No other disposal option is much better.

Saving While Sudsing Your Duds

I've heard that front loading washing machines save energy and money. Is that true?

LINDA WISEMAN
Davenport, Florida

YES. FRONT LOADERS USE ABOUT ONE-THIRD

less water and energy than top loaders. They also require less detergent and their spin cycles remove more moisture from clothes than top loaders, reducing the total time spent in energy-intensive driers. According to Sears Roebuck, a front loader can save an average family up to 5,000 gallons of water annually compared to top loaders. The consulting company E Source, a for-profit spinoff of the Rocky Mountain Institute, estimates that if you do 300 loads a year a front loader will save about \$100 annually.

Washing machines clean by flipping and rotating garments in soapy water. A top loading ("vertical axis") machine must use enough water to float your duds so the "agitator" can give the clothes a tumble. In a front loading ("horizontal axis") machine, the horizontal spinning drum gyrates the clothes without floating them. The front loader uses smaller amounts of water, and less water means less energy is required for heating. Also, rotating the drum expends less energy than powering an agitator. (A bonus: According to Perry Chlan, a spokesman for Sears Roebuck, front loaders tumble the clothes more times per minute than top loaders, which gets clothes cleaner.)

Front loaders are the standard in Europe, but comprise just four percent of North American washing-machine sales. Staber Industries (614-836-5995) and Frigidaire (614-792-4750) are two domestic manufacturers. The Frigidaire is available at Sears under the Kenmore brand and from White Westinghouse (800-245-0600), which distributes to retail outlets. Priced around \$650, it's significantly more expensive than comparable top loaders due to the small volume of sales in the U.S. But you should make up the cost difference (and then some) over the machine's lifetime.

Why do front loaders dominate the market in Europe while sales are mostly a washout in the U.S.? Beyond deep-seated consumer preference, there doesn't seem to be any real explanation.

Questions? Write: Ask Garbage, 2 Main St., Gloucester, MA 01930. Sorry, due to the volume of questions we receive, we can't provide individual responses.

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5. Recycled Acid-Free Papers — A complete selection of the finest recycled papers available in many finishes. Free samples available to trade and business customers only. *Cross-Poiste.*

6. Office Recycling — Complete systems for office recycling from desk to dock. Unique combination of products and educational materials assist offices in efficient internal recycling. Deskside paper collection files, intermediate containers. Brochure, 75¢. *SAFCO.*

21. Recycling Action Kit — Facts and success stories to get recycling started in your town. *Recycle America®* is the nation's largest voluntary curbside recycling program. Free kit. *Waste Management, Inc.*

22. Socially Conscious Long Distance — Giving 1% of your long distance charges to groups working for the environment, peace, human rights, and economic justice at no extra cost to you. In fact, the base rates are lower than AT&T, MCI, and Sprint. Free information. *Working Assets Long Distance.*

28. Parnassus Fund — Goes against the established wisdom of Wall Street. Fund follows a "contrarian" policy of investing in stocks that are out of favor with the financial community. Takes social and environmental factors into consideration when making investment decisions. Free prospectus. *Parnassus fund.*

81. Clothing & Sportswear — A complete line of technical clothing, layering systems, and sportswear. Free color catalog. *Patagonia.*

100. Non-toxic Paints, Wood Preservatives & Stains — Many ecologically safe products available. Dealer inquiries welcome. Free catalog. *Eco Design Company.*

119. String Bags — 100% cotton, reusable shopping bags. Available wholesale only. Easy to customize for premium and fundraising uses. Colors and styles to choose from. Please include phone number and company or

organization name. Free wholesale literature. *Eco-Bags.*

130. Environmental Investing — Develop income and invest in life-supportive products and services. Free information. *Pax World Fund.*

168. Paper & Printing — Supplier of 100% post-consumer fine paper. Handling large and small orders. Free recycled paper informational kit including printed samples. *Crestwood Recycled Paper.*

170. Socially Conscious Bank Checks — Carry the messages of Greenpeace, NOW, Audubon, MADD, PETA and other national organizations. Accepted in all U.S. financial institutions. Free samples. *Message!Check Corp.*

171. Printer Ribbon Reloading — Remanufacturing of most computer printer ribbons and laser toner cartridges. Also offering new products for the computer environment. Brochure, \$1.75. *The Ribbon Factory.*

179. Earth-Healthy Alternatives — 100% cotton shower curtain, shampoo in a bar, all-natural deodorant stone, cellulose sponges, cotton string bags, and more. Catalog, \$1.25. *N.O.P.E.*

192. Environmental Promotion Products — Made from 100% recycled material. Paper, plastic, and glass imprinted items to promote business or community programs. Free catalog. *Signature Marketing.*

202. Responsible Mutual Funds — Investing in diversified portfolios of well-established companies who consider the full impact of their decisions on all stockholders. Free prospectus. *Calvert Securities Corp.*

225. Cross Country Ski Exercise — Providing the world's best total-body and cardiovascular workout. Free brochure and video. *Nordic Track.*

250. 100% Postconsumer Recycled Paper — Quest is a premium text and cover paper made entirely from nondeinked post-consumer wastepaper. Free swatchbook. *Simpson Paper Company.*

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Circle the numbers of the items you want. We'll forward your request to the appropriate companies. They will mail the literature directly to you ... which should arrive 30 to 60 days from receipt of your request. Price of literature, if any, follows the number. Your check, including the \$3 processing fee, should be made out to GARBAGE.

5.	Free	100.	Free	179.	\$1.25	275.	Free	294.	Free
6.	75¢	119.	Free	192.	Free	280.	Free	295.	Free
21.	Free	130.	Free	202.	Free	286.	Free		
22.	Free	168.	Free	225.	Free	287.	Free		
29.	Free	170.	Free	250.	Free	291.	Free		
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274. Environmental Products — Vitamins, supplements, household & personal care items. Nilfisk vacuum cleaners, Northwood saunas, Allarmed & E.L. Foust air purifiers and many other specialty items. Free catalog. Engen Drug Allergy Division.

275. Remanufactured Printer Ribbons — Don't throw away your old nylon printer ribbons. Brand new high quality nylon installed in the old plastic at a reduced cost to you. Free literature. NWORKS.

280. Environmental Cleaning — Time-saving, step-by-step cleaning system from Dell books: "Speed Cleaning," "Spring Cleaning," "Clutter Control." Plus environmentally and personally SAFE supplies, tools, and equipment. Free catalog. The Clean Team.

285. Petroleum Storage — UL listed, secondary containment tank for petroleum products. Above ground storage. Two complete steel tanks, one nested inside of the other with full bottom, side, and end separation. Applicable for storage of waste oil, and flammable and combustible liquids. Free information. Enviro-Care Tank Systems.

287. Restored Footwear — An innovative program to restore Vibram-soled footwear. List of mail-order repair shops included. Free literature. Quabang Corporation.

291. 100% Post-Consumer Products — A variety of office supplies, kitchen & bathroom products, and outdoor furniture made 100% from post-consumer waste. Free catalog. Real Recycled.

293. For The Chemically Sensitive — Household skin care, hair care, and personal care products that have no added color, perfumes, or other unnecessary additives. Free catalog. Coastline Products.

294. Water Purification Equipment — Residential and commercial water distillation equipment. Nature's way to purify water. Free information. Pure Water, Inc.

295. Lead Removal Water Filters — Remove dangerous lead from your family's drinking water easily and economically. Water filters are offered in both under and over the counter models. No installation required. A complete line of water filters available at reduced costs. Free information. Selecto, Inc.

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Earmarks on the Piggy Bank

IN 16TH-CENTURY ENGLAND, FARMERS CULLED THEIR SWINE FROM the village herd by checking "earmarks" — notches on pigs' ears that signified ownership. These days, "earmarks" refer to a different kind of pork: taxpayers' money going to a powerful Congressman's pet project without review by the rest of Congress. The earmarks that really make me bristle are those that feed science projects at universities.

Members of Congress' appropriations subcommittees bring home sow belies to the same schools, year after year after year. There's no juried competition for the awards, no peer review by Congressional authorizing committees or independent experts. While institutions like Iowa State University (\$91 million in earmarks from 1980-'92) and Oregon Health Sciences University (\$84 million) live high on the hog, the larder is closed to the vast majority of colleges.

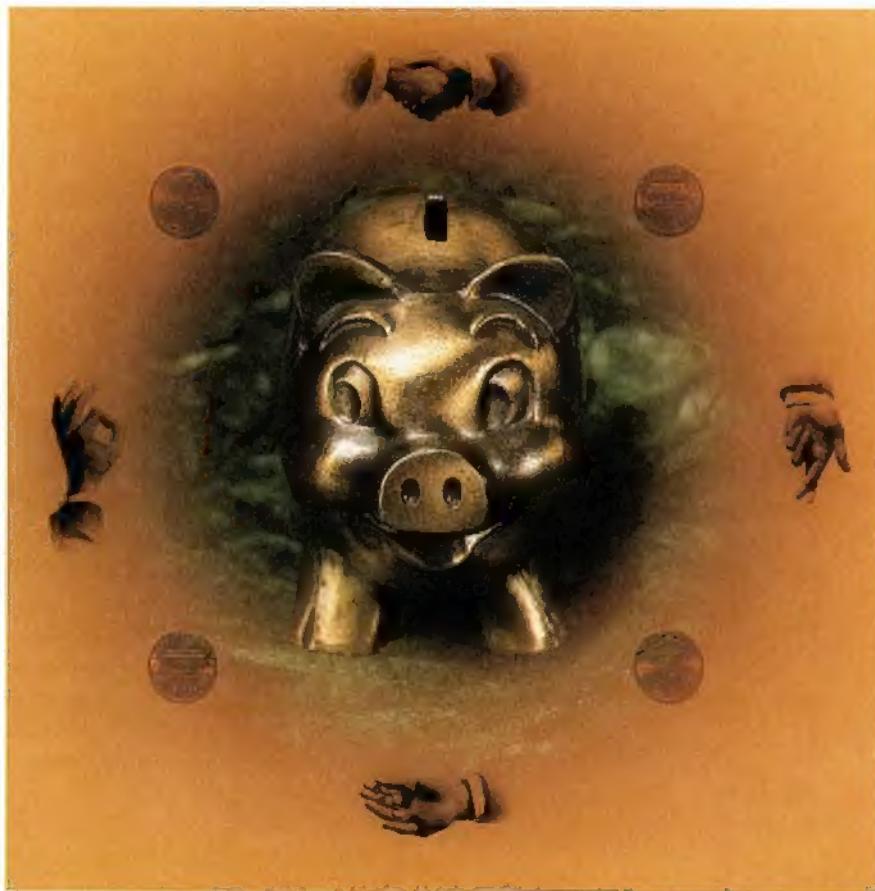
Delta College is one case in point. When the two-year community college in Bay City, Michigan, decided to replace its 30-year-old planetarium with one that's better equipped to dazzle, it turned to local Congressman Bob Traxler for help. Never mind that the school does not offer a major in astronomy, physics, or even general science. Never mind that Mr. Traxler (who retired from office in January) was helping to slash hundreds of millions from the 1992 budget requests of the National Science Foundation, NASA, the EPA, and other research agencies, according to *Science*. As chairman of the House appropriations subcommittee that funds scientific research, Mr. Traxler found a way to carve out an \$8 million hunk of bacon for Delta College.

I'm sure some earmarks meet real needs, transforming financially impover-

ished projects from sows' ears to silk purses. That's not the point. Academic earmarks are concocted in closed door consultations that leave the rest of us standing in the hall, wondering what's going on inside. They reward influence and patronage instead of merit and need.

If there's a good guy in all of this, it could well be Rep. George Brown, chairman of the House Science, Space, and Technology committee. The California Democrat has vowed to get Congress to change its pigheaded ways and instead implement competitive, peer-reviewed awards programs for science projects and facilities. Rep. Brown says of earmarks: "The government and the taxpayer are the real losers as a result of this practice." Ditto for meritorious science.

Sooooooooooey!! It's high time we call the projects home, put them through peer review, and deliver patronage-sponsored earmarks to the Dumpster. ▀





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phantom reductions, noun — Decreases in a manufacturing facility's reported emissions of toxic pollutants which are unrelated to cleaner production processes.

Phantom reductions have been known to haunt the national Toxics Release Inventory (TRI) ever since the term was coined by the authors of a 1990 National Wildlife Federation report entitled "Phantom Reductions: Tracking Toxic Trends."

Mandated by the Emergency Planning and Community Right To Know Act, the TRI is a national accounting of toxic chemicals released into the nation's air, water, and soil. When results from the latest (1991) survey came in, the EPA trumpeted a 9 percent decline in emissions since 1990, and a 30 percent reduction since 1988. And then ... behold: Regulators took a closer look at 1,200 of the reporting facilities and found that more than half of their diminutions may have come from the nether-world of phantom reductions.

How is a phantom conjured up? Typically, a company employs a new accounting method to recalculate release estimates. Or it petitions the EPA to have a chemical it releases taken off the TRI list. Or it substitutes an unlisted (but toxic) chemical instead of a listed one. Of course, a decline in overall production also results in a reduction in overall chemical releases.

Phantom reductions aren't necessarily evil spirits — merely ephemeral. Some of the new accounting methods that produce lower estimates may indeed be more accurate than the old ones. And not all of the reductions reported in the TRI are ghosts. Tangible source reduction also occurs when products are reformulated to reduce the use of toxic chemicals, when maintenance and production processes are modified to cut waste, or when hazardous chemicals are replaced with safer ones.

"All independent reviews of the TRI have shown some examples of real pollution prevention and pollution control, and some examples of phantom reductions," says Paul Orum, coordinator of the non-profit Working Group on Community-Right-To-Know. "The trick is figuring out which is which."

Pp

